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# THE INSIDE STORY

This issue of VIDEO & SOUND is a landmark of sorts. It marks the formal establishment of the magazine as a quarterly—it will be published in March, June, September, and December this year—and, for the first time, we are offering VIDEO & SOUND by subscription. (See page 32 for details.) The reasons are simple—our first five issues have met with steadily growing popularity and our regular readers have asked to receive V&S by subscription.

This month you'll find a special report on the latest new technologies as exemplified in new products shown at the recent Consumer Electronics Show. Among the hot products this year are portable Compact Disc players, hi-fi VCRs, and the new generation of lightweight camcorders. Our special 10-test report section includes in-depth reviews on several of these components—the Sony D-7 Discman and Technics SL-XP7 portable CD players and the Sony SL-HF900 Super Beta and JVC HR-D566U HQ VHS Hi-Fi VCRs. Following the test reports you'll find a special section devoted to more than 60 CD reviews.

Heading up our features is "The New-Tech Dilemma" by E. Brad Meyer, an avid recordist, who writes frequently on audio and video topics. Focusing on the broad array of audio and video components currently available, Meyer discusses which product types are and aren't likely to change in the near future. The result is a comprehensive guide to which components you should consider buying now and which are worth waiting for. And regular V&S contributor Robert Angus is back again this issue with a look at premium videotapes. As he explains, determining what constitutes "premium" can take a good deal of homework.

Also contributing to this issue are many of the staff of our sister publication, HIGH FIDELITY, including Editor Michael Riggs, Technical Editor David Ranada, and Consulting Technical Editor Robert Long.

*William Tynan*

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ON THE COVER: Pioneer PD-M6 Compact Disc changer; Sony SL-HF900 Super Beta Hi-Fi videocassette recorder; Denon DCD-1800R Compact Disc player.

# VIDEO & SOUND

# SUMMER

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\*BET value: The measure indicates the fineness of the magnetic particles contained on a tape expressed in units of square meters per gram (m<sup>2</sup>/g). The higher the BET value, the finer and more numerous the particles—and the greater the tape's video and audio performance capability.



# GLOSSARY

**ALIGNMENT** Any of several adjustments to the physical relationship between a tape head and the tape itself. Most frequently encountered is that for azimuth—the perpendicularity of the head gap to the direction of tape travel. Others are: height—the position of the gap relative to the edges of the tape; tilt—parallelism between the head surface and that of the tape; tangency—rotation of the head so that the gap falls within the tape area contacted by the head.

**BETA I/II/III** In video, the three transport speeds of Beta tape decks. The very earliest models offered only Beta I; no current models will record at this speed and some will not play Beta I. Beta II is half the transport speed of Beta I and will record or play for three hours on an L-750 cassette; it is the standard speed for commercial Beta prerecorded cassettes. Beta III is one third the Beta I transport speed and will record or play for as long as four and a half hours on an L-750 cassette.

**BIAS** In recording, a signal component added during recording to increase the linearity (accuracy) of the waveform reproduction. DC bias, which is only moderately efficient in this respect, at one time was commonplace in inexpensive portables; high-frequency AC (often near 100 kHz in audio cassette decks) is virtually universal today.

**BIT** In digital technology, the irreducible logic or information element—a “yes” or a “no,” or a “1” or a “0”; literally, a *binary digit*.

**CHROMA** In video, the **COLOR SATURATION** (purity) of the image. Often used more broadly to refer to the color element of a picture.

**CHROMA DIFFERENTIAL GAIN** In video, changes in **COLOR SATURATION** occasioned by changes in brightness (luminance) level.

**COLOR SATURATION** Intensity, or purity, of hue. The more saturated a color is, the less white it contains; among greens, for example, those that are “greenest” are those that are the most saturated.

**COMPACT DISC (CD)** The most widely accepted form of digital audio disc (DAD), developed initially by Philips and Sony and now available from most major record labels.

**COMPANDER** A device that compresses dynamic range (usually during recording) and expands it reciprocally (in playback). Its action often is expressed as a ratio: A 2:1:2 compander reduces dynamic range by half during recording and then doubles it again by expansion during playback. (See also **EXPANDER**.)

**DECIBEL (dB)** A unit expressing a ratio of two quantities, the basis for many acoustic and electrical measurements. Literally, it is one tenth of a Bel (named after Alexander Graham Bell) with 1 Bel (10 dB) representing a voltage factor of 20 (a 20:1 or 1:20 ratio), a power factor of 10 (a 10:1 or 1:10 ratio), and a subjective loudness factor of approximately 2. The decibel thus is subjectively a small difference, but often a significant one. Because the dB scale is logarithmic (rather than arithmetic), 20 dB constitutes a hundred-fold difference in power, 30 dB a thousand-fold difference.

**DIGITAL FILTER** One in which the waveform alteration is made while it is in digital form—by manipulation of the data stream representing it—as opposed to a filter designed to alter analog waveforms.

**DYNAMIC RANGE** The difference, expressed in dB, between the loudest and softest sounds in a sound or a recording or between the distortion ceiling (overload) and noise floor in a recording medium or electronic component.

**EQUALIZATION (EQ)** Electronic alteration of frequency response, either to depart from or to restore flat response, in which all frequencies are reproduced equally. Tone controls are a simple form of equalizer. Tape recorders use equalization both in recording and in playback.

**ERROR CONCEALMENT** In digital audio, any technique for mitigating the effects of lost waveform data short of reconstructing it.

**ERROR CORRECTION** In digital audio, the exact reconstruction of lost bits or bytes from redundant codes (which are redundant with the main code stream only as long as the latter is intact.)

**EXPANDER** An electrical device or circuit that exaggerates existing differences in signal level to expand dynamic range. It is used to counteract the compression regularly applied to audio signals intended for home reproduction.

**FILTER** An electrical circuit that removes—actually, attenuates—some portion of the frequency response range. Infrasonic filters inhibit passage of frequencies below the audible range (nominally, below 20 Hz) and ultrasonic filters those above it (above 20 kHz); low (rumble) filters work on the bottom end of the audible range, and high (hiss) filters on the top end. Filters that reduce response at low frequencies and pass the high ones unaltered also are called high-pass filters; the converse are called low-pass. Notch filters attenuate a very narrow frequency band and pass the spectrum both above and below it.

**FLUTTER** A relatively rapid fluctuation in pitch, most often caused by a variation in drive speed of a turntable or tape deck. (See also **wow**.)

**FREQUENCY RESPONSE** The relative strengths with which different parts of the audio (or other) spectrum are re-



produced. If all frequencies are reproduced equally (see EQ), response is said to be flat. If not, it usually is characterized as the frequency range over which all portions are within so many dB of an assumed reference level.

**HEADROOM** The difference, in dB, between the recording level at which overload (usually defined as 3-percent distortion) occurs and some reference level. In the midrange, the reference level may be DIN 0 dB (technically, 250 nanowebers per meter of magnetic signal density on the tape) or the 0-dB indication of the deck's meters; otherwise (particularly at high frequencies, where overload occurs at much lower signal levels), the reference is the maximum expected signal level.

**HERTZ (Hz)** A unit of frequency (named for physicist Heinrich Hertz) equal to one cycle per second (cps). A kilohertz (kHz) is equal to 1,000 Hz. By common consent, the audible band is

conceived of as reaching from 20 Hz to 20 kHz, though individual hearing varies. Radio and other communications reach into the range of megahertz (MHz) and gigahertz (GHz)—millions and billions of hertz, respectively.

**INTERMODULATION (IM)** Interference between two or more tones in a program signal that generates a new tone or tones, known as beat frequencies. Radio tuners use this principle to translate carrier frequencies down toward the audio band by beating them against a tone generated by a local oscillator within the tuner. When the phenomenon is unintentional and unwanted, it is called intermodulation distortion.

**LINE LEVEL** An audio signal whose maximum swings run to roughly  $\pm 1$  volt, and therefore the standard signal level for most audio connections that use regular pin (RCA or phono) jacks. Inputs for signals from tuners, CD

players, video equipment, separate phono preamps, and other equipment intended for use with an aux input are presumed to deliver line-level signals; tape equipment and most signal processors such as equalizers, EXPANDERS, and so on, accept line-level inputs as well. (Note that European DIN standards assume lower line levels. If your equipment is fitted with DIN connectors, it presumably is designed to these standards.)

**LUMINANCE** In video, the brightness or black-and-white element in the picture and the signal that controls this element—as opposed to chrominance, the color element.

**MULTIBURST RESPONSE** In video, the reproduction of a special test signal that includes signal bursts at increasing frequencies (usually from 500 kHz to 4.2 MHz). A frequency beyond the reproduction capabilities of the video  
(Continued on page 9)

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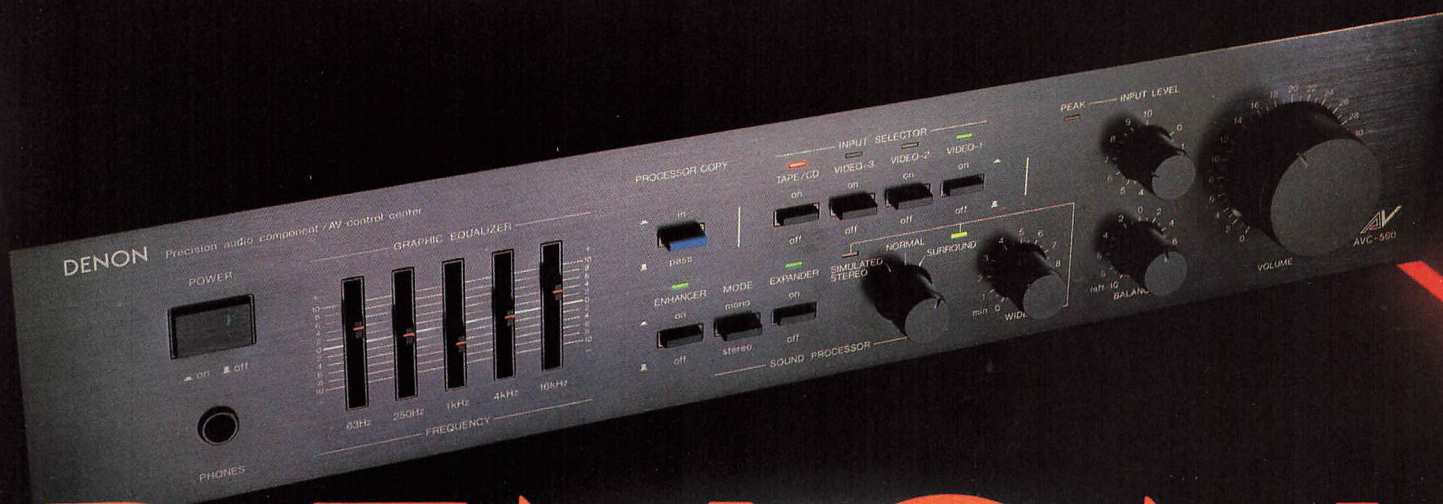
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Rather than tack an audio receiver onto a video switcher, Denon incorporated full video switching into the powerful new DRA-Series AM/FM Stereo Receivers.

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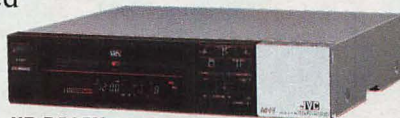
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**HR-D565U**  
HQ HI-FI STEREO VIDEOCASSETTE RECORDER

**THE GOAL IS PERFECTION.**

Hi-Fi **VIDSTAR**  **VHS**



(Continued from page 6)

equipment will be greatly attenuated. Maximum horizontal picture resolution can be calculated from the highest burst frequency that is adequately reproduced.

**MULTIPLEX** A means of "piggybacking" one signal or signal complex on another through the use of subcarriers so that the original signals can be recovered independently.

**OVERSAMPLING** In digital audio, a digital-to-analog (D/A) conversion technique in which the digital information is read repeatedly and treated as though the **SAMPLING RATE** were correspondingly higher. This makes it possible to use a **DIGITAL FILTER** and a 14-bit D/A converter for performance equivalent to that of a 16-bit converter in a more conventional system.

**RANDOM-ACCESS MEMORY (RAM)** In computers, the portion of memory to which programs or data can be loaded to establish the processes and applications that are available for use.

**SAMPLING RATE** In digital audio, the frequency with which the fluctuating analog waveform is quantified digitally. This rate must always be more than twice the highest frequency that is to be preserved.

**SENSITIVITY** The minimum input signal level that will achieve certain specified results. Thus, the lower the rating or measurement, the more sensitive the input. For example, a tape deck whose line input sensitivity is 50 millivolts (mV) for a recording level of 0 dB is more sensitive than one requiring 150 millivolts for the same recording level.

**SIGNAL-TO-NOISE RATIO (S/N)** The difference, in dB, between the maximum assumed signal level (in some instances, a 0-dB reference) and inherent **NOISE**. The signal may be measured unweighted or weighted; "A" weighting—which approximates, in simplified electrical form, human aural sensitiv-

ity across the audible frequency band—is frequently used.

**SQUARE WAVE** An oscillation consisting entirely of sharp transients (voltage changes) separated by brief, sustained positive and negative voltages. Square waves can be generated by adding to a fundamental all of its odd harmonics—the third, fifth, seventh, and so on. It has a very raspy sound, is useful for certain kinds of testing, and is more likely to damage tweeters than sine waves of comparable frequency and amplitude.

**STEREO IMAGES** The spatial illusion created by multichannel recordings that are correctly made and reproduced, enabling instruments or voices to be localized.

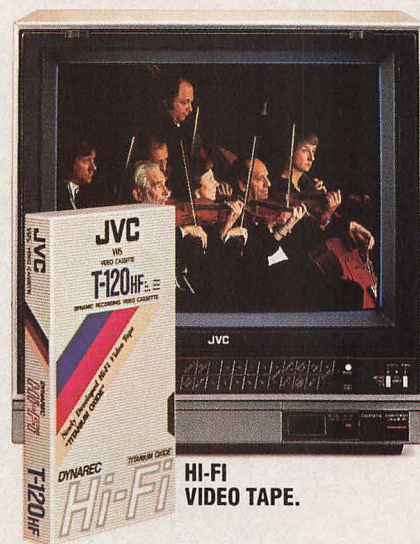
**TINT** In video, hue. Because color information is encoded by phase modulation, the entire "color wheel" can be "rotated" by adding a phase shift. Thus, for example, red can be shifted toward yellow, green toward cyan, and blue toward magenta. For obscure reasons, the receiver control to achieve this often is labeled tint, though this term has long been used in the fine arts to specify a color to which white has been added.

**TOTAL HARMONIC DISTORTION (THD)** The most common of all distortion measurements, expressing the root-mean-square (rms) sum of all spurious harmonics created when a pure sine-wave test tone is passed through a circuit or device. Usual practice is to express the distortion as a percentage of the original tone (3-percent distortion has three hundredths the energy in the tone); sometimes it is expressed as so many decibels down from the test tone (-30 dB in this case).

**WOW** A relatively slow variation in **PITCH**, usually caused by inconsistent drive speed in tape or disc equipment. Other frequent causes: warped LPs or those with off-center center holes (eccentric pressings). (See also **FLUTTER**.)

VS

# THE BEST VIDEO TAPE FOR RECORDING BEETHOVEN, BACH AND THE BEATLES.



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# NEW TECHNOLOGIES

The latest in portable CD players, CD changers, and 8mm and VHS HQ VCRs, plus special reports on the Japan Audio Fair, satellite TV signal scrambling, and digital signal processing

## CD PLAYERS

### PORTABLES SET THE PACE

The big trend in Compact Disc players is toward small models, either portable or AC-powered, judging from introductions at the recent Consumer Electronics Show. Nearly a quarter of all CD players sold in the U.S. last year were portables, and the category is expected to almost double in size this year.

Sony's \$300 D-5 began it all. Originally intended as a specialty item for the upscale portable market, the D-5 sold briskly long before a single carrying case or battery pack arrived on these shores. Obviously, people were using D-5s at home in place of larger and more expensive tabletop units. Though the smaller player is less convenient and lacks some features, it's affordable and sound quality is good.

The \$300 Technics SL-XP7 is smaller and lighter than the Sony D-5, espe-

similar to the Technics—but without programmability and carrying a \$50



**PIONEER PD-C7**

lower price tag—will appear soon bearing parent company Matsushita's Panasonic and Quasar brand names.

Most recently, Sony has struck back with the D-7, the smallest and most shock-resistant player on the market; even with the battery pack, it is smaller than the original D-5. (Sony has also introduced a more convenient portable power supply for the older model.) The D-7 is priced at \$300, while the D-5 is now discounted to under \$200. Similar in appearance to the D-7 but lacking programmability is Pioneer's PD-C7 player, which can be used by itself or slipped into a portable "boombox" system (\$299; AC adapter extra). Other boomboxes with built-in CD players have been introduced by Sanyo, Fisher, Magnavox, Panasonic, and Toshiba.

Lowest list price for a portable player is \$229 for the Sanyo CP-10, with 16-selection programming. The

\$300 Hitachi DA-1000 has a music-scan mode that plays the first few seconds of each cut and can repeat either whole discs or programmed segments. New CD portables also were introduced by Magnavox and Hitachi.

Reflecting the increasing use of



**SONY D-7 DISCMAN**

portable players at home is the design of Toshiba's \$300 XR-P9: An AC adapter tilts the player up at a 45-degree angle, allowing easy access to top-mounted pushbuttons. Included in the purchase price are an infrared remote control and a matching receiver that attaches to the top of the player. The unit has 16-selection programmability that, like the remote control, works only with AC power. Toshiba also showed a small AC-only player, the XR-J9. At 5½ inches deep by 1¾ inches high by 8 inches wide, it's about the size of a large paperback. The XR-J9 has a regular ¼-inch headphone jack and lists



**TECHNICS SL-XP7**

cially when the battery packs are attached, and it can be programmed to play tracks in random order. Models



for \$200, which should translate to a discounted price of close to \$150, barring further strengthening of the yen against the dollar. The word "transportable" has been borrowed from computer lingo to describe AC-only players that are easy to pick up and carry around.

Portable-CD owners who do buy battery packs will sooner or later think of using their players in the car, partly because in-car players are both expensive and theft-prone. But driving with headphones on is dangerous and in many states illegal; better to connect the player somehow to the existing car system.

This can be accomplished in several ways. Jensen makes a CD-adaptable in-dash receiver with input jack and patch cord. Concord and Sparkomatic market similar units with dual cords that also power the portable. (Unfortunately, input connectors and voltages are not completely standardized, so this solution will not work with all players.) Philips solves the problem of where to

stash the player with an in-car unit that accepts its own portable (the CD-10, \$399) in a DIN-sized slide-out tray.

Two devices, each costing only \$20, enable you to use any portable Compact Disc or cassette player in the car. One is Sparkomatic's CDA-50 adapter, an FM converter that takes the audio signals from a headphone output and broadcasts them to the car's receiver. The other is Recoton's CD-20 Car Cassette Adapter, an audio cassette shell with a patch cord coming out of the back corner; inside is an equalization network and, where the pressure pad usually goes, a tape head. The adapter goes into the car's tape deck (the cord is flexible so that tape transports that swallow the entire cassette won't break it), and the internal head couples the signal magnetically into the car's playback head and thence into your electronics.

With any of these installations, you have the problem of getting the CD out of its jewel box and into the player, not an easy task even with two hands. The

answer: Sony's trunk-mounted Disc Jockey, a programmable ten-CD changer with a separate 3/4-inch-high remote control. The control unit fits in a DIN-sized dash slot, but can be used from elsewhere in the car and hidden away when you get out. One of the Disc Jockey's features would be welcome in any car CD installation: a two-position switchable compressor circuit that limits the CD's excessive (for the car) dynamic range. The Disc Jockey costs \$995 and requires an external power amplifier and speakers. A separate tuner module is \$130; the compressor works with its output as well.

## TABLETOP PLAYERS

Designers of full-size players, unwilling to cede the entire market to small machines, have added new features at all prices. Virtually everyone is now using digital filtering in tabletop machines. The filters in new players from Technics and Hitachi have much less ripple than previous designs, with response variations held to less than 0.01 dB. Philips's new decoder uses four-times oversampling, as in its previous models, but now has full 16-bit decoding.

"Lifetime memory" based on semiconductors called EAROMs, which store more than 700 selections, is incorporated into Magnavox's CDB-650 (\$430). Using FTS (Favorite Track Selection), you can instruct the player to memorize as many as five selections in any order along with the disc's catalog number (encoded on all CDs in the area inside the music tracks). When that same disc is loaded again, pushing FTS retrieves your preselected program. The EAROMs retain their information even if the player is unplugged for months or years. Another feature the CDB-650 shares with many new models is a so-called record-pause mode, which automatically inserts four seconds of silence between the preprogrammed selections for taping on cassette decks whose track-search features require a minimum hiatus.

New home CD changers offer programmed play from a much larger selection of music, but compatibility problems are already emerging. Record companies might issue multiple-disc sets—Beethoven's nine symphonies or the Handel organ concertos—packaged in a magazine that would slip



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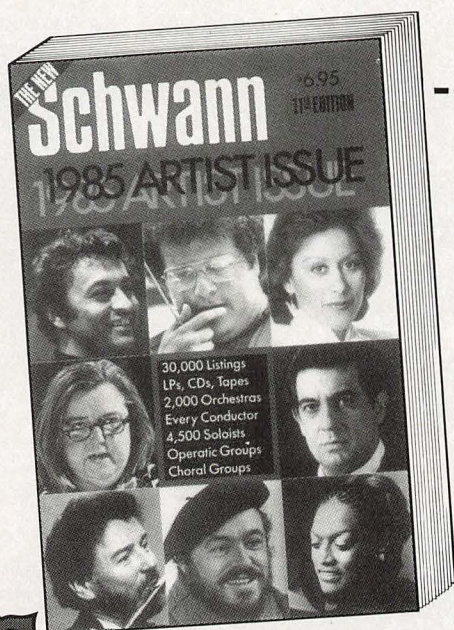
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**PIONEER PD-M6 COMPACT DISC CHANGER**

into a player, eliminating all necessity for handling the discs themselves. But that presupposes a standard magazine, which does not now exist.

The first home changer was the \$499 Pioneer PD-M6, with a one-inch-thick magazine holding six discs. (Playing a single disc requires that you put it into a special one-CD holder.) Sony's car player takes a ten-disc magazine, and Mitsubishi's new changer, the \$450 DP-309, has a five-disc magazine sized to match a VHS cassette, on the assumption that some people will already have storage facilities for them.

In a different category altogether is the Nikko NCD-600, which stores as many as 60 discs in its magazine and accepts add-on modules for a total of 240 CDs. Only five selections can be programmed for automatic play, unless you connect the NCD-600 to an external computer, in which case your preselections are unlimited. The Nikko's versatile pitch controls, and its \$4,400 price tag, reveal it as a professional model intended for studio use by disc jockeys and sound-effects people.

Remote control is spreading to lower-priced CD players. The new NAD 5330 lists for \$348, the Sharp DX-620 for \$290, and a Sanyo remote model for \$249. Technics's top-of-the-line model, the \$575 SL-P500, adds remote-controlable volume to the usual functions.

A weakening dollar has slowed or stopped the decline in prices of basic models. Last summer, Symphonic offered the lowest price (\$179) of any player, which reportedly would have gone to \$159 had not the yen risen in value. Nevertheless, many suppliers say that prices of \$129 or \$139 will be common this summer, with occasional specials for less than \$100.

## HIGH-END PLAYERS

For those willing to pay more, a healthy high-end CD market is developing. Tandberg's \$1,295 TCP-3015A

player has no internal feedback and no coupling capacitors; it wins an ergonomics award for its generously large and accessible pushbuttons. PS Audio also sells its CD player, incorporating a Philips transport with modified electronics, for \$1,295. The proliferation award goes to Yamaha for introducing seven new separates plus three other players designed for its one-brand rack systems. The \$995 CD-2000 has a variable output with a front-panel fluorescent display showing its settings; the similarly priced CD-2000M has 600-ohm balanced outputs and extra shielding for broadcast use.

The British firm of Cambridge Audio makes a \$2,400 CD player that comprises two boxes, one for the player and one for its power supply. A newly introduced third box, costing \$600, contains three cumulative error counters showing different types of both corrected and uncorrected tracking errors. (One of our own discs, then being used as a demo for its fourth CES, showed eight corrected and no uncorrected errors in about 90 seconds of play.)

Sony introduced a CD player last year with an optional outboard D/A (digital to analog) converter and filter; the total price of that system was over \$2,000. Hitachi's new high-end model, the DA-003, also has an outboard converter, but the price for both boxes is less than \$1,000. Connectors and digital coding have been standardized, so converter and player outputs are compatible. Signals from these outputs could be routed before decoding to future digital signal processors for equalization, compression, reverberation, four-channel synthesis, audio measurement and analysis, and so on.

## SUBCODES AND CD-ROM

Another standard in the industry is the coding scheme for graphics (text or pictures), which can be inaudibly mixed

with the digital bit stream of a CD. Many of this year's high-priced CD players have output jacks to feed the graphics signals to external amplifiers that will send the information to your TV. The decoders themselves, however, were nowhere to be seen.

Though each CD can hold many megabytes of data just in its subcodes, this technology should not be confused with CD-ROM, an incompatible CD format designed for computer data. Several CD-ROM systems were displayed at the show; they are scheduled to reach the market this year for between \$700 and \$1,500. For those who need rapid access to large amounts of fixed data—say, the Encyclopaedia Britannica—CD-ROM is mouthwatering indeed.

## CD ACCESSORIES

CD cleaners continue to proliferate, along with claims and counterclaims about whose method is best. The latest twist comes from Audiosource with its Laser Lens Cleaner. For \$29 you can get a CD with a soft brush cemented to the underside. Loading it into the player causes the disc to spin, removing dust and smoke from the lens to prevent mistracking.

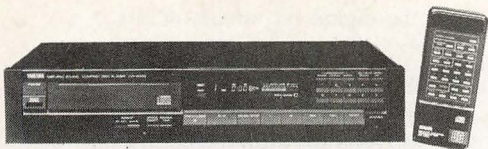
Most CD owners have something of a storage problem. The plastic jewel boxes protect the discs well, but they don't use the space on most existing shelves efficiently. Interlocking CD cases let you stack two layers on shelves with 1-foot vertical spacing, but many of these have individual separators, reducing horizontal packing density and preventing the insertion of multiple-disc boxes. Besides, many shelves are too deep for the 5½-inch boxes.

Geneva (formerly Nortronics) has introduced a CD storage system consisting of a 12-inch-square flat case holding four jewel boxes. The cases will fit perfectly on shelves designed for your LP collection; the only draw-



**MITSUBISHI DP-309 CD CHANGER**





#### YAMAHA CD-2000 CD PLAYER

back is that you can read only half the titles by looking at the spines.

### VIDEO

#### PRICE GIVES WAY TO QUALITY

As VCR sales approach the saturation point in the U.S., manufacturers are shifting away from a strategy of packing in the most features for the least money to paying long-overdue attention to picture quality.

VHS HQ, that format's answer to Super Beta, was much in evidence at the Winter CES. Instead of raising the luminance carrier frequency, as with Super Beta, VHS HQ uses a combination of vertical signal averaging for reduction of chroma noise and elevated white clip level for sharper edges. (See "New Technologies," VIDEO & SOUND,

Vol. 5, and "What VHS HQ Does," page 61.) The technique will be appearing in new machines from NEC, Panasonic, JVC, Hitachi, Quasar, Marantz, Fisher, Toshiba, and Sanyo, whose presence in the VHS camp makes it the only manufacturer of all three home tape formats. VHS HQ machines range from less than \$1,000 to \$1,800 in suggested retail price, and most also include VHS Hi-Fi sound. The first pre-recorded VHS HQ cassettes should appear in rental racks this summer.

Korean maker Samsung showed a VHS play-only machine, the VT-503P for \$199; it's meant as a second home machine or for rental by video software outlets. As the VT-503P only plays videocassettes and does not record them, will it become known as a VCP?

Eight-millimeter video was everywhere, especially in the form of combination camera-recorders, or camcorders, many of which now appear in camera stores carrying brand names (Canon, Kodak, Polaroid) previously associated with photography. Sanyo, Sony, Goldstar, Samsung, and Aiwa also debuted 8mm camcorders at the

show, and National (Matsushita), Toshiba, and Hitachi will offer them for sale in Japan this spring, presaging later introductions here.

The 8mm transports are small, so Sony hid one in a TV set. The KVB-25VXR (\$2,200) uses a Trinitron XBR monitor/receiver with a built-in digital-audio-capable 8mm video recorder. Because the recorder fits into the bottom of the TV chassis beneath the picture tube, no external connections are required; programming is easy with on-screen displays of instructions or error messages ("Please insert a tape"; "The timer has not been set").

To offset the threat of 8mm, VHS manufacturers are beginning to include VHS HQ in one-piece portables. NEC's V-10U has HQ circuitry plus automatic focus and white balance and a 6:1 zoom lens with macro capability. At \$1,695 it competes directly with Sony's high-end Video-8 unit, though its use of the standard VHS cassette makes the NEC larger and heavier.

JVC has tackled the size problem by combining HQ circuitry with an updated version of its VHS-C format. The new camcorder is almost as small and



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light as an 8mm model, and thanks to the addition of the EP (SLP) speed, a T-20 cassette can now record for a full 60 minutes. (To emphasize that the small cassette can be played in a normal VHS deck, JVC is dropping the "VHS-C" designation and simply referring to the tiny cassette as "T-20.") A prototype of the new camcorder, which contains a 1/2-inch CCD, had good low-light performance and better freedom from smear



**PENTAX VHS CAMCORDER**

during panning than an 8mm unit during a side-by-side comparison at CES. It is scheduled to go on sale later this year for less than \$1,500.

Home movies aside, no video format can survive without prerecorded software, especially the rental of Hollywood films, and here 8mm lags far behind VHS and Beta. About the only popular title released so far in 8mm is *Beverly Hills Cop*. With Hollywood producers apparently content to enjoy the fruits of the lucrative half-inch (VHS and Beta) business, 8mm hardware manufacturers are pitching in. Kodak will offer 8mm duplicating equipment, and Sony Video Software Co. and Pioneer's LCD America will begin to produce 8mm movies soon.

## VIDEO MONITORS

Both big- and small-screen monitors made news at CES. Mitsubishi's 35-inch direct-view set, the CK-3501R, offers an 86% increase in viewing area over a 26-inch model. The Mitsubishi will be available in April for about \$3,200. Kloss Video's Novabeam 100 front-projection set (\$3,500), available configured for diagonal screen sizes of 60, 78, or 120 inches, has a new detail-enhancing circuit called the Faroudja Image Processing System, which improves the contrast of fine details with-

out producing artificial-looking outlines around large objects. The 100's remote control is unusually versatile, enabling you to adjust brightness, contrast, hue, color saturation, and convergence from your chair.

Large-screen fans who lack room for a front-projection set have had to make do with the reduced contrast and resolution of the more compact rear-projection designs. But Pioneer's new SD-P40 (\$3,500) 40-inch rear-projection set offers very good detail and more brightness (300 foot-lamberts) than some front-projection sets.

At the other end of the scale is a 1-pound LCD color TV whose 3-inch picture has much greater sharpness and contrast than previous LCD sets. The screen on Panasonic's Pocket Watch (\$300) can pop up to make use of ambient light or fold flat against an internal backlight. The Pocket Watch runs for more than six hours outdoors on a set of six AA batteries or about 1 1/2 hours with the backlight. An AC adapter is included.

## DIGITAL VIDEO

Although there is no current prospect for direct broadcast of digital video signals, VLSI chips now exist to convert the picture to digital form inside a TV

put for use with a home computer. Using a remote control, you can select any input for PIP display in one corner of the screen. The NEC also contains digital memory (RAM) to store and display as many as three still pictures at once.

(Toshiba has included similar digital circuitry in a VCR, the model M-6900. The digital memory is used to present flawless still-frame and slow-motion either from the tape or from an incoming broadcast signal.)

Hitachi showed a TV set in which the digital circuitry actually is used to enhance picture quality. Each horizontal scan line is stored and used to generate an additional line containing a point-by-point average of the original scan lines above and below it. This process, known as scan doubling, creates a smoother and more detailed display by painting a 525-line picture 60 times per second, twice as fast as usual. Hitachi's prototype digital set failed to show off the technique to best advantage, but the idea holds promise for better television picture quality using existing broadcast standards.

*E. Brad Meyer*

## JAPAN'S "CES"

To an American brought up on a steady diet of Consumer Electronics Shows and local hi-fi exhibitions, Japan's Audio Fair (which precedes the Winter CES) has stood as the venerated Mecca, the time and place where new products are not so much displayed as unveiled with a grandeur approaching revelation. But I must report, with the agreement of the half-dozen audio pilgrims who accompanied me and of several others who did time there, that this past show, held at the Harumi Exhibition grounds in Tokyo, proved to be high-order humbug.

We were little prepared for the overwhelming uniformity of appearance, performance, and features characterizing most of the new products. Neither were we ready for what seemed to be a lack of innovation in design. One hankered after the quirks of high-end audio.

For example, most major companies had complete lines of Compact Disc players running from about ¥44,800 to ¥180,000 (\$224-\$900, at ¥200 = \$1.00) or higher. Nearly all of



**NEC V-10U VHS HQ CAMCORDER**

set. So far, this circuitry has been used mainly for special effects like picture-in-picture (PIP), in which a second program, usually from a VCR, is displayed in a small portion of the screen. Sony's 27-inch digital Trinitron (\$1,700) has both PIP and two video tuners, so that you can watch a second broadcast source without an external tuner or VCR.

NEC's digital monitor, the DT-2680A (available in May) has three inputs for video signals (from VCRs or external video tuners) plus an RGB in-



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The six-head YV-1000 VHS Hi-Fi video deck is the first of the new generation of VHS machines. With its advanced HQ circuitry, it provides 20% greater picture definition over previous VHS decks. Along with improved brightness and color signal, and reduced video noise. Even in the extended play mode.

And because the circuitry is VHS Hi-Fi, the same high tracking speed that's used to record the video is used to record the audio. So the YV-1000 has a frequency response from 20Hz to 20kHz, dynamic range of 80dB, channel separation of 60dB and virtually unmeasurable wow and flutter. For hi-fi sound that's measurably better than any you've heard.

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the models had black front panels, drawer loading mechanisms, cueing and programming features that got more versatile as the price rose, infrared remote controls on the top units in each line, and practically identical audio specifications. Digital filters, having been found a highly salable feature, seemed to be replacing analog filters in many product lines (Technics, Sony, and Hitachi, among others); soon the analog vs. digital filter controversy will be moot.

There *were* a few interesting CD products. Alpine showed a car CD changer (with most of the works mounted in the trunk), and Hitachi unveiled its DAD-P100 portable (¥54,800, or approximately \$274), nicknamed the "With Me." Those who were with *me* hoped the nickname would be changed or dropped by the time the unit reached the U.S. It was otherwise rather attractive, measuring 7¾ by 1¾ by 6½ inches, weighing about 2½ pounds with its integral battery pack, and available (at least in Japan) in decorator colors suitable for inclusion in *Miami Vice* and other well-designed TV shows. (Other CD players, VCRs, portables, and even blank tape also received the designer-color treatment; a line of cassette tapes in colored shells from Denon was being marketed in Japan specifically for ten- to eighteen-year-old girls.)

## WHAT HAPPENED TO DAT?

Where was digital-audio tape? No-where to be seen! Sony and a couple of others did have invitation-only rooms nearby where prototype digital-audio cassette machines were shown, but there was nothing similar on the show floor. I was told that the Japanese are waiting for the marketplace to settle down before they introduce yet another home entertainment medium. With the international hubbub over CD availability, the class struggle between Beta and VHS, the slow development of the videodisc market, the already confusing introduction of 8mm video, and the lead time for the production of RDAT chips, Japanese companies do not see the next few months as being propitious for digital tape. Perhaps by midyear. . . .

By the time one got beyond the acres of CD players, there was very little of overwhelming interest at the exhibition, which is about one-fifth the



A MOCK-UP OF MARANTZ'S DPM-7 DIGITAL-SIGNAL-PROCESSING INTEGRATED AMPLIFIER

size of the American Consumer Electronics Show. As might be expected at a CD-slanted event, new analog turntable concepts were practically nonexistent, except for a couple of units from Kenwood. Apparently Kenwood's engineers have decided that turntable-spindle wobble (astronomers and gyroscope makers call it precession) is an important source of wow and flutter. Their solution is a special spindle design in the KP-880DII and KP-770D Dynamic Center Lock direct-drive units. Little in cassette deck technology was introduced, though several new dubbing models had recording capability on both transports. Receivers have never been popular in Japan, so there were few new ones, though audio-video units were heavily promoted.

Although this was primarily an audio exposition, videodiscs, always more popular in Japan than elsewhere, made a strong showing, with traditionally nonvideodisc companies (like Yamaha and Teac) promoting Laservision players, and others (Matsushita, JVC) pushing the VHD system. Many Hi-Fi VCRs and video surround-sound processors were on display, as were 8mm VCRs with companded digital-audio recording capability. And there was a demonstration room housing two projection televisions and four direct-view (picture-tube) sets, all showing spectacular wide-screen, high-definition-TV images. You'd never imagine that television could look so good: It was better, in some ways, than 35mm and 70mm film (less flicker with moving objects on a large screen). News from the high-definition-TV front indicates that there will be one worldwide production (not broadcast) standard for its signals, making the medium ideal for video-based cultural exchange programs (if and when HDTV ever hits the marketplace).

Perhaps because of the lack of innovation elsewhere, one component stood out as being almost visionary. Not yet a product, it hadn't even advanced to the preproduction stage. All that was shown was a front panel with various indicator lights on a chassis devoid of any circuitry except for the indicators' power supply. But what was described—in a Japanese-only data sheet—was the first glimpse of home audio's future: the Marantz DPM-7 *digital signal processing* integrated amplifier.

Marantz, at least in Japan, is an arm of Philips and the lucky beneficiary of much of that company's most advanced technology. The DPM-7's share consists of five Acoustic Signal Processor integrated circuits. Operating directly on the digital output of a CD player or DAT deck, or on the converted-to-digital outputs of any analog audio component, the chips are programmed to simultaneously perform four main tasks. These are graphic equalization ( $\pm 12$  dB in 2-dB steps over octave bands, with four EQ memories), reverberation synthesis (with controllable reverb time, "depth," and hall absorption), compression or expansion (with three selectable "release" times), and control of an octave-band spectrum-analyzer display (with an unusually wide dynamic range of 72 dB). The unit contains 16-bit analog-to-digital converters that sample at 44.1 kHz to obtain a digital bit stream from analog input signals; reconversion from digital to analog takes place at the last practical moment—just before the volume control feeding the 100-watt-per-channel power-amplifier section. The price, ¥350,000 (\$1,750), is steep only if you ignore what these functions performed with equivalent quality would cost if purchased in individual components (a good, professional-quality dig-





**HOW WILL SCRAMBLING AFFECT BACKYARD SATELLITE TV ANTENNAS?**

ital reverberator alone costs well over \$1,000). To me, this one product—the first offering sophisticated digital signal manipulation to the home consumer—saved the Japan Audio Fair from being just another ho-hum show. The future has arrived. I hope it works.

(The Japanese proclivity for using 800- or 8,000-yen figures is equivalent to our 95 or 99 dollars or cents; “less than ¥10,000” means ¥9,800, much as “less than \$100” means \$99.95. Also, a price mentioned here is the Japanese list price for that specific model number. Not all of the products will be released in the U.S.; they will certainly cost more here and may have different designations.)

*David Ranada*

### SCRAMBLED SIGNALS

January 15—“The day the sky went dark,” one reporter dubbed it. What happened? Home Box Office (HBO) and its sister premium movie cable service, Cinemax, pulled the plug on the nation’s backyard satellite dish antennas, all 1.5 million of them: The two “satcasters” began full-time scrambling of their signals, turning them into an unwatchable video hash.

Cable subscribers saw it as a case of getting even with their rural compatriots who had been getting a free ride while city and suburban dwellers paid \$3.95 or more a month for the same, albeit wired-in, premium movie service. City-based journalists saw it as the beginning-of-the-end for all home satellite reception. On the other hand, many

dish owners, able to extract only one or two snowy broadcast-TV signals from their rooftop antennas, viewed the scrambling as the loss of only a few out of the more than 100 regularly scheduled satellite channels. And the manufacturers of antennas and their related electronics surprised everybody by hailing the move as the salvation of the satellite-antenna industry because it removed buyer-inhibiting confusion about scrambling. So, how much impact will scrambling have, and what countermeasures are there, if any?

One solution is a descrambler. HBO and the others love these devices because merely possessing one doesn’t guarantee you access to the programs. The decoder must be authorized by a central computer to receive the programs—and only the programs—you’ve paid for. Don’t pay your monthly bill—which could range from \$3.95 to more than \$60—and the computer will shut off your decoder. If you can find one, a descrambler capable of decoding HBO or Cinemax (they’re available on an extremely limited basis from Channel Master and M/A-Com) will cost you \$395 plus the monthly programming-service fee.

A problem with the decoder “solution” is that video-signal characteristics can be varied in more than one way. Cancom and the X-rated Fun Channel use an encryption system developed by Oak-Orion, while HBO and others use the rival M/A-Com VideoCipher II. Other analog-based scrambling systems already are in use or are

proposed, raising the specter of a satellite enthusiast who wants to see everything having to buy three or four (or more) decoders. Because no regulating agency for satcasting signal formats exists, there’s no easy way of establishing a universal scrambling system, even if the various programmers were interested in doing so, which they are not. And what scares some dish owners even more is the real possibility that after a large number of VideoCipher decoders has been sold, HBO and the rest of the pack could switch to some other form of encryption (such as the all-digital B-Mac system from Scientific Atlanta).

While the FCC has been loath to intrude on satellite programming on behalf of the dish owner, it seems some members of Congress have been counting the number of dishes in their districts and have decided that there are more votes to be gained in protecting the interests of dish owners than in looking out for the cable industry. Some, like Senators Barry Goldwater (R-Arizona) and Albert Gore (D-Tennessee) and Representative Judd Gregg (R-New Hampshire), are dish owners themselves and resent the efforts of the cable industry to label them signal pirates. Representative Gregg has introduced a bill calling for a two-year moratorium on scrambling until the satcasters, cable operators, dish users, and Hollywood producers sort things out. Other congressional voices have called for limits on the amounts programmers might charge dish owners above what cable subscribers are paying.

Nobody seriously believes that scrambling will convert all 1.5 million backyard dishes into birdbaths (the open-mesh antennas don’t even hold water). Most dish owners are resigned to eventually paying for what they’ve been getting free, at least as far as the pay-cable channels are concerned. But a potential audience of 1.5 million affluent homes is not to be dismissed lightly, and several satcasters have already said they’ll serve the home market with shop-at-home services, religion, rock videos, softcore porn, and other advertiser-sponsored special-interest programs (narrowcasts). And everybody believes that marketing of HBO, et al., directly to the home consumer, bypassing the cable companies at



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So the next time you read about components that are "completely new," be skeptical. You don't have to go back to ground zero when you build something right in the first place.



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D E S I G N I N T E G R I T Y

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times, will eventually occur.

In any case, dish owners balking at a decoder will always have much to watch. Early this year, the trade magazine *Home Satellite Marketing* counted at least 32 satellite programmers it said would never scramble, including those of the Canadian Broadcasting Corporation, PBS, a group of TV evangelists, Spanish-language stations from Mexico, the Armed Forces Satellite Network, C-SPAN (current affairs plus the proceedings of the House of Representatives), and the Canadian House of Commons Debates. True, these lack the glamor of HBO, Cinemax, and the Playboy Channel, but they do provide a wide diversity of information and entertainment (including sports, music videos, news, and cultural and dramatic programming), not to mention breathtakingly clear pictures that look very good to a rural family used to watching Dan Rather and precious little else. And who says viewing legislators in action can't be good entertainment—with comedy and tragedy rolled into one?

*Robert Angus*

## DIGITAL DESIGNS ON THE FUTURE

The overall design, or "architecture," of digital signal processing (DSP) systems could soon become a major issue in the growth of home audio technology.

High-speed processor and multiplier chips were first shown by Sony at last October's Audio Engineering Society convention as part of a computer specialized for processing audio signals while they are in digital form. Doing so has three major advantages: The distortion and noise inherent in analog processing and in repeated analog-to-digital (A/D) conversion are avoided, much more complex processing is practical than with analog circuits, and alterations of the processing are achieved by changing computer programs (software), not hardware.

Sony's chips are very accurate and very fast. At 8 million instructions per second, they perform their operations faster than any personal computer programmed to do the same things. The engineers' suggested applications for the chips include equalizers, mixers, reverberators, compressors, expanders, spectrum analyzers, and sampling-rate

converters. It is conceivable that the circuits will appear in consumer products.

What's most important about these chips is that they represent the leading edge of the iceberg, so to speak. Their functions and capabilities, though considerable, are not unique. The military has used similar devices for several years, and other, vaguely comparable signal processors are available from Texas Instruments and NEC. More audio-oriented DSP circuits undoubtedly are under development. Marantz of Japan already has announced an amplifier using five Philips DSP chips. All these circuits, though they can be programmed to perform the same functions, are different and incompatible: Software designed to run on the TI chips will not operate on the Sony devices, and vice versa.

The internal designs of such complex integrated circuits can have a profound effect on their performance in a DSP system. Whereas some chips may be able to do several things at once (equalization and compression, plus artificial reverberation, for example), others may have to be connected in parallel. On the whole, there is now, and will continue to be for some time, a wide diversity in the abilities of DSP chips, which may have important design and performance consequences for the consumer.

Watchers of and participants in the personal-computer marketplace have already seen the effects of such chip-to-chip differences. At present, nearly all of the personal-computer industry is clustered around three architecturally distinct microprocessors. The IBM PC and its clones use the Intel 8086 family, the Apple II and Commodore 64 computers both use the Commodore-originated 6502 (though in totally incompatible ways), and the Apple Macintosh and Commodore Amiga use the Motorola 68000, also incompatibly. The non-transferability of software between these machines prevents someone from using a program developed for Computer A in Computer B, unless the software writer provides another version for the second machine or the operator buys an expensive circuit or program that will essentially turn Computer B into a temporary mimic of Computer A.

This is not a call for standardiza-

tion, however. Those aspects of consumer digital audio most needing regulation (the CD and RDAT systems and the signal format for direct digital connections between home digital-audio components) already have been standardized. Anyway, the home audio industry has never handled attempts at standardization very well. Just remember the 45- vs. 33-rpm controversy, the various quadriphonic systems, the clumsy methods of mounting phono cartridges (until P-Mount), and the current multitude of incompatible infrared remote controls. What the nascent digital-audio business does not need is an ossification of development around a specific, and not necessarily good, processor architecture. I certainly would not endorse any standard that would saddle the next generation with the digital equivalent of the pin plug (a despicable little connector from the beginning).

If not standardization, what would I like to see? At least one DSP system with a configuration "open" enough (nonproprietary) to allow software development independent of the system's originators. This is how IBM has handled personal computers, and it is one of the main reasons for that company's success in the field. Contrast this with the difficulty Apple has had marketing the rather proprietary Macintosh, despite that computer's innovative traits.

As I see it, the consumer has been and will be best served by the availability of different and competitive approaches to the solution of sonic problems. But that competition must not come only from parties overseas. Once home DSP gets over the equalizer-on-a-chip stage, and after software for all the standard audio functions has been written, further developments will depend more on psychoacoustics and taste. And the latter, at least, seems to be quite culture specific. I fear that many good domestic ideas for improving sound quality via DSP may never receive commercial embodiment, since all the consumer DSP hardware will originate overseas. As the vivacity of the domestic personal-computer market has shown, a healthy diversity can come only when the necessary development tools are freely available to all potential software writers.

*David Ranada*





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T H E

# NEW-TECH DILEMMA

Which audio and video  
technologies  
are really worth waiting for?

What should you buy now?

BY E. BRAD MEYER

**N**ew technologies in audio and video always make things more confusing for the consumer. Even after you understand how everything works, what the latest developments mean, and what's coming up and when, you don't always know what to do next—specifically, what to buy next. Most people assume that today's hardware is "better" than last month's, let alone last year's. But as the saying goes, the pioneer is the guy with the arrows sticking out of his back. This is clear to anyone who was the first on the block to own a Cartrivision video recorder, an Elcaset tape deck, a CD-4 four-channel decoder, or even the first Sony Betamax, which had a one-hour maximum recording time and won't play prerecorded software. Some were advances, but all failed in the marketplace, partly because they lacked the fea-

tures or performance necessary for widespread acceptance. In short, they were too little, too soon (or, in the case of the Elcaset, too late).

So let's hear it for mature technologies! The criteria for maturity? An audio or video medium is mature when every recording is compatible with every player, when adults know how to use the equipment as skillfully as their children, and when it would be hard to imagine life without it. A medium is immature when you have to ask what kind of player someone has before trading recordings, when disputes still rage over whether the medium is really better than its immediate predecessor, and when there are no stores devoted exclusively to selling it. By these criteria, the only audio media that qualify as mature are the LP, the 45-rpm single, stereo FM radio, and the Compact Cassette. Although the



Compact Disc hasn't made it yet, it has grown faster than anyone expected: Many (not all) players are simple to operate, and the first CD-only stores have just appeared. Note also that there are no mature video media (except broadcast television), though the predominance of the VHS tape format places it in late adolescence.

That said, we must watch out for the still immature areas in audio and video, where developments are capable of rendering current equipment obsolete. Stopping at each major product category, I'll try to peer into the future to help you decide whether to buy now or wait a few months for the next newfangled gizmo.



Turntables are easy: If you need one, buy one. After a century of evolution, turntables are a mature technology:

The best ones are excellent, and the best of the cheap models are remarkably good. Furthermore, research and development in the lower price categories has ground almost to a halt, though high-end manufacturers are still making minor improvements (sometimes by rediscovering an older, forgotten design principle). If you choose wisely, your next turntable may be the last you'll ever need, barring total equipment breakdown.

Some people are now asking whether they should even include a turntable as part of a new music system. A few small classical and jazz labels produce only cassettes and Compact Discs, and new purchasers may hesitate before buying into a technology that, to them, seems to be dying. I still see a turntable as an essential part of any music system. The biggest reason is the vast selection of LPs available, more than 20 times the size of the current CD catalog and greater than that of the prerecorded cassette as well. If you're interested in getting high-quality sonics, don't be misled by the cassette's larger market share, which comes solely from its durability and portability: The average LP still sounds much better. However, if you're interested only in listening to mainstream repertory or the greatest hits of recent years, it's possible that you'll miss nothing with a CD-only system.

You should also buy cartridges and styli now, especially if your current pickup or stylus is more than two years old. But choose a brand with care: The coming shakeout in the cartridge industry could leave the unwary consumer without a source of high-quality replacement styli. The largest companies almost certainly will be around many years: They will diversify to survive and will keep on making styli in a back room somewhere.

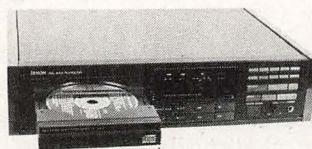
On the other end of the scale, the makers of esoteric high-end moving-coil cartridges (which don't have replaceable styli anyway) have always served

a small, dedicated clientele and will probably find enough loyal analog-disc partisans to keep them going. Unfortunately, those of you who lack faith in the longevity of this high-end market may need to remortgage the house to buy enough \$1,200 cartridges to keep you supplied from here on out.



Particularly useful cassette-deck features, such as automatic tape calibration and quick autoreverse, have steadily become cheaper, more reliable, and more widespread, as have powerful noise reduction systems like Dolby C and DBX and other signal-processing advances like Dolby HX-Pro. Continued rapid improvements in cassette technology will be difficult, however, partly because the new evaporated-metal tape formulations are not being adapted for audio-only recorders. What you really need to know is whether analog tape will be obsolete in three or four years, replaced by one of the new digital recording formats: rotary- or stationary-head PCM tape, 8mm video with companded PCM audio encoding, or maybe even recordable Compact Discs.

At this point, you don't need to worry. Digital recorders will be considerably more expensive than their analog counterparts, so the basic \$150 Dolby B deck will be around for a long time. You have probably amassed a pretty big collection of cassettes by this time, and you'll need something durable to play them on. If your present deck is four or five years old, or if it lacks one of the more powerful noise reduction systems, now is a good time to trade up. (Don't forget to try your old tapes on any new machine to ensure compatibility of equalization and head alignment before you get rid of the recorder that made them.) By the time your new cassette deck gives up the ghost, the surviving digital technologies (if there are any) will be cheaper and bug-free.



Prices of basic Compact Disc players will continue to fall, albeit not much lower than the \$160 level they have reached in some retail markets. There are listeners who report hearing significant improvements in the sound of CD players; the lack of agreement among these people on which models sound best (not to mention their inability to distinguish the "good" models in double-blind tests) suggests that any differences are, at most, minor. Compatibility between players and discs is assured by the international CD standard and by the Sony/Philips stranglehold on CD patents. Meanwhile, there have been and will continue to be meaningful improvements in tracking ability, features, and convenience, and companies will offer portable CD players that are small-





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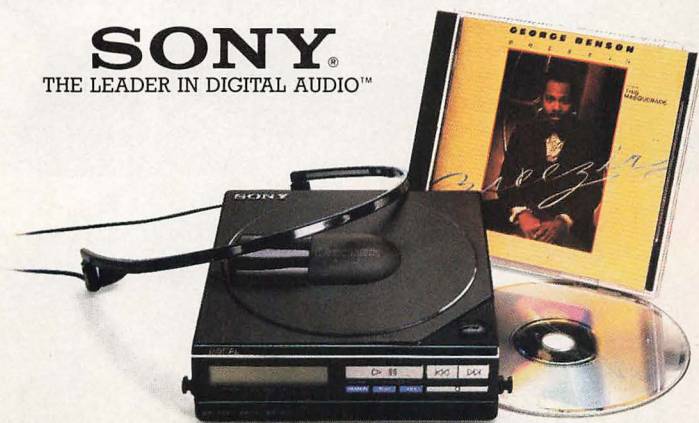
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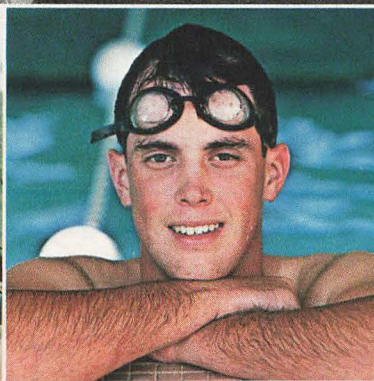
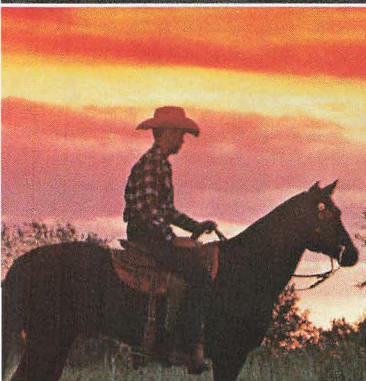
"I found exactly what I was looking for, in the Army.

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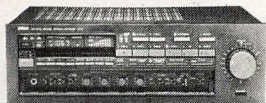




er and car models that are more shock-resistant.

The next year or so will bring Compact Disc players with facilities for extracting information from the subcodes that on future discs may contain liner notes, librettos, or even still pictures. If such multimedia or interactive presentations intrigue you, you may want to wait and see what happens. The CD will also make its long-awaited entry as a computer-data storage medium. However, this is only peripherally related to audio, the player required for computer Compact Discs (CD ROMs) being very different from an audio model.

Considering only music playback, whether you should go the CD route depends on your feelings about the sound and the music available on current discs. If you like what you hear, you need not fear that your player will be notably inferior in sound quality to anything coming a year or two down the road. Major improvements in CD sound are precluded by the medium's digital encoding standard, which probably is good enough for the foreseeable future. But if your musical tastes roam even a little off the beaten path, you may have to wait another year or so before overloaded CD pressing plants can cater to your software needs.



FMX, a technique developed by CBS engineers, applies noise reduction to a specially modulated stereo-FM subcarrier. It promises reception as quiet as monaural with only a small increase in tuner cost: less than \$10 in parts. Whether this system will do you any good depends on your location relative to the stations you like. If you often find yourself using the mono button on your tuner, FMX will be worth waiting for. It is said that FMX tuners will be compatible with normal transmissions and that FMX transmissions will be compatible with normal receivers. These claims can't be verified yet because there are no FMX tuners available and only a few stations experimentally broadcasting an FMX signal.

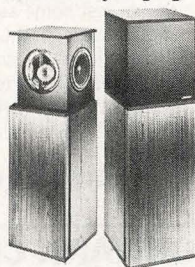
Don't expect any real benefits from FMX to accrue until at least a year from now: The system requires modification of both transmitters and receivers. Stations will take a while to change over, and component manufacturers need time to design the circuit into their products. The increased stereo coverage given by FMX will provide a good financial incentive for many kinds of stations to convert, so you may find that you can receive interesting, newly licensed low-power stations serving specialized markets.

Aside from FMX, there is very little on the FM-tuner horizon in the way of substantial improvement, meaning that you can buy today with confidence. Most progress is being made in areas where

performance was already adequate five or ten years ago: distortion, separation, and signal-to-noise ratio. And a cost-effective, practical solution to multipath—the oldest, biggest, and most daunting problem with FM—still eludes the best engineers.

Ultimately (in this case, within ten to fifteen years), most audio electronics will either handle digital signals exclusively or convert analog signals to digital form for internal computerized signal processing. Sophisticated digital algorithms for equalization, hiss reduction, and the removal of ticks and pops have already been written. To make use of them, products must be reinvented, not just redesigned, a process that will probably take at least three or four years.

Meanwhile, preamplifiers, amplifiers, and signal processors get steadily smaller, lighter, cheaper, and better-sounding, though progress now comes in small increments (in contrast to the pace of the late '70s). If you choose well—concentrating on proper impedance matching, high output current capability, and convenient, noise-free operation—there is no reason to expect that you'll regret your purchase of any present-day equipment for quite a while.



For loudspeakers, the most radical and interesting of recent advances have been in stereo imaging. Companies like Acoustic Research, Bose, DBX, and Polk have begun to use psychoacoustical data and measurement techniques, collected and analyzed with the aid of computers, to create new speaker radiation patterns with improved specificity of localization, depth of image, and rendering of reverberant space. The products emerging from this research are still somewhat experimental and therefore both complex and expensive. DBX has already announced a second-generation product for about half the cost of its initial effort, and many of the other technologies have fallen in price as well.

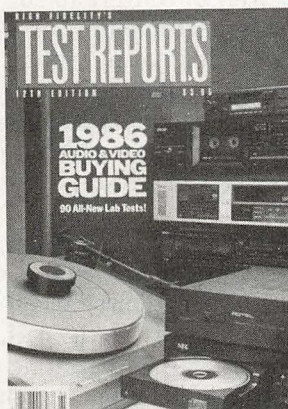
The sonic and technical differences among even these models remind us that in loudspeaker design there is as much variation around the ideal of perfect reproduction as there is steady progress toward it. More than other audio components, speakers are bought for the overall subjective impression they give, as opposed to the methods used to achieve it. You may like the latest models, or you may find that nothing can take the place of your old favorites. The greatest speakers of the past 30 years are still great. Since nothing can change the sound of a system as much as a new pair of speakers, whether a certain model sounds attractive and convincing is more important than any new technical wrinkle.



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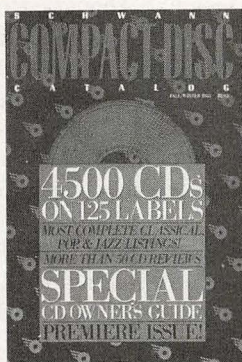
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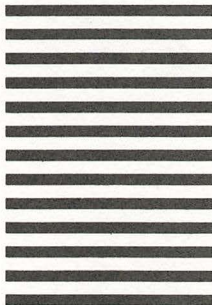
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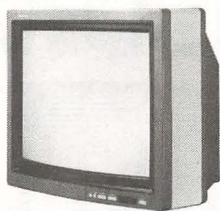
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The recent adaptation to consumer video equipment of wide-bandwidth circuitry developed for computer displays has greatly improved the potential picture quality of video monitors

and television sets. The big question for the near future is whether monitors with digital signal processing will bring further upgradings in clarity, apparent resolution, and smoothness of motion through the synthesis of additional scan lines and the cancellation of multipath interference ("ghost" busting). Products using these techniques may appear within the year. At the moment, the word *digital* on a TV monitor betokens only such nonessential features as the ability to display a second picture within the main one or to store text entered into memory through the remote control or the presence of a jack on the back accepting the video output from a computer. Because considerable picture-quality improvements may come via outboard signal-processing boxes, it makes sense to ask if a set can accommodate that kind of unit. Some processing will result in a cleaned-up composite-video signal that will be compatible with any monitor's video input; other techniques will require entirely new sets.

Without advanced signal processing, monitor quality has gone just about as far as it can. Wide-bandwidth models already have luminance resolution exceeding the theoretical limits of television broadcasts, not to mention those of VCRs. Improvements are likely to come only in the traditional video battlegrounds: picture brightness and color rendition. Since these are ultimately matters of taste, buy a high-resolution set, if you like it.

VCRs are changing fast. Hi-Fi circuitry for Beta and VHS has proven its value to audio-conscious movie renters; the Super Beta machines (and, to a somewhat lesser degree, their VHS counterparts) have noticeably improved picture quality. However, many recent Hi-Fi recorders cannot decode stereo broadcasts because they were designed before the standardization of the stereo TV format.

If you're wondering about buying MTS stereo decoding in your next VCR, your decision will depend less on whether you want to watch music videos or Johnny Carson in stereo than on whether your local broadcasters are willing to invest in the necessary transmitting equipment. Call them to find out. If you have only cable, an MTS-capable VCR or TV tuner probably won't do you much good; you'll be more interested in whether your new machine has an FM-simulcast switch.

The real wild card in VCRs is the 8mm format. The sound of those models with digital audio is very good, but if you need the highest picture quality,

stick with Super Beta. (As mentioned above, an 8mm VCR with digital audio circuitry may be a good choice for audio-only applications.) The 8mm recorders are smaller and more convenient than their half-inch cousins, an important advantage if you do a lot of home camera work.

The big disadvantage of 8mm is that prerecorded programs won't become available in any quantity until mid-1986 or later, and even that deadline depends on the timely arrival of two-hour or longer cassettes (the current maximum being 90 minutes). Confirmed movie-renting addicts should stay with VHS and await the improvements in its picture quality promised for VCR models introduced in 1986.

The latest addition to the videodisc is a digital soundtrack recorded along with the picture. The only videodisc players that can decode it also play CDs, resulting in a massive and expensive component possibly duplicating a function you already have in your music system. If you must have the very best sound from the few digitally encoded videodiscs, either buy a model that will accommodate a soon-to-be-available outboard digital-audio decoder or wait for a more compact video-only player with built-in decoding.



JVC, in what many observers see as an incredible attempt to recoup its massive development

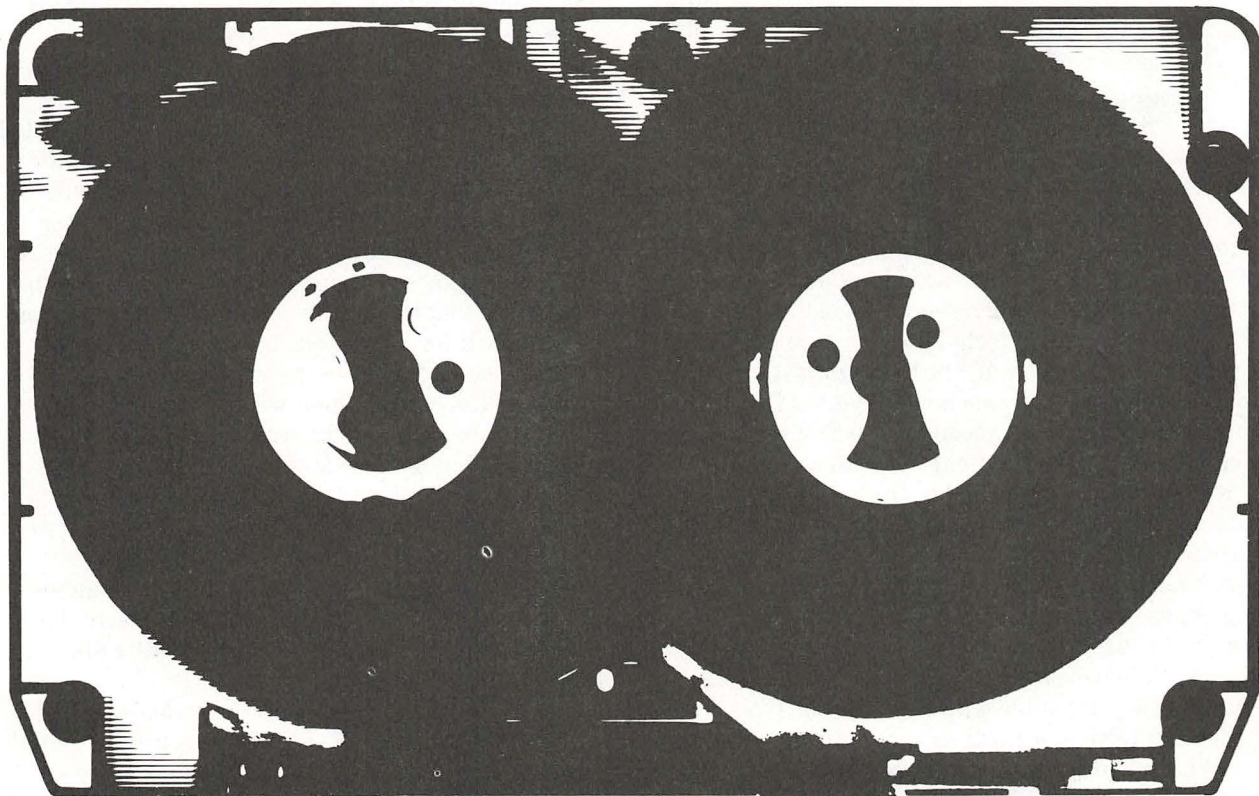
costs, has once again announced that it will be reintroducing its stylus-read VHD system to the U.S. market. VHD pressings are much easier and cheaper to make than Laservision's laminated discs, but even this may not help. The videodisc market itself is expanding very slowly, and despite reductions in player cost and complexity, it doesn't look like the medium will catch on in a big way. Too bad, for true videophiles know that disc systems remain the best source of video programming.

As we have seen, the maturation of most new audio and video technologies depends not just on the manufacturing of innovative playback or receiving equipment but also on the simultaneous introduction of new formats and transmission methods. In each case, there is the classic chicken-and-egg problem: Home equipment makers wait for the availability of software or broadcasts, while program producers await the presence of a significant population of users. The key question is whether the new way of doing things will really take hold. That will happen only if the new way is obviously "better" than the old, as exemplified by the success of the Compact Disc vs. the failure of quadraphonics. Of the categories we've examined, only FM tuners, video monitors, videocassette recorders, and videodisc players need give you pause; for the others, the green flag is out.

VS



# BUYING A PREMIUM



## VIDEOTAPE?

What distinguishes high- and standard-grade videocassettes?  
Is the difference worth the price?

BY ROBERT ANGUS

Once upon a time, videotape was videotape. It all came out of only two or three factories in Japan and a couple in the U.S. And all the tapes met the minimum technical and dimensional specifications set down by the licensors of the Beta and VHS formats. Although there were some small differences between brands, videocassettes of yore mostly did whatever recordists asked of them, and they did it well enough to make the business very large indeed.

Those were simpler times. The recent proliferation of premium-priced tapes has left the average shopper bewildered and even the experts confused. If a "premium" tape is one that is touted as superior

to the least expensive or "standard grade" tape in a manufacturer's line, some companies offer no fewer than *five* of them. For example, in ascending order of price, the premium videocassettes from Scotch are EG+, EXG, EXG Hi-Fi, EXG Camera, and EXG Pro. Nor is Scotch alone in this tape-breeding enterprise. TDK, JVC, Memorex, and other leading brands have beefed up their premium offerings, even though this segment accounts for only about 15 percent of the total videotape sales in the U.S.

Selecting a high-quality tape is made even more difficult by the lack of industry-wide standards for videocassette testing and rating, not to mention by nomenclature. You can't even fully trust a videotape



data sheet, though finding one in the first place should be considered a positive sign. Marketplace confusion is not reduced by a manufacturer's freedom to call what is actually a standard-grade tape by a premium-sounding name. A handful of brands have been known to simply label the *same* tape separately as "standard" and "high grade." And one company, which didn't actually make its own tape, was in the embarrassing position a few years back of buying a very good standard-grade product from one supplier and a very poor premium tape from another. Considering all these factors, many experts feel that tape test reports, unless they are conducted using an unusually large number of samples of each videocassette, are not as reliable as they should be. So the questions persist: Is there *really*

**BEWARE OF ANY CLAIMS THAT A PARTICULAR VIDEOTAPE PROVIDES IMPROVED DETAIL.**

that much of a difference between standard and premium grades? If so, what performance characteristics are improved with premium tapes? And are they worth the sometimes substantially higher cost?

In theory, at least, there are differences, and they can be important. The two principal respects in which high-grade tapes offer visible improvement are noise and dropouts. Noise, in video, can be broken down into two related types: luminance noise (often called "video noise" on tape data sheets) and chroma (color) noise. Both show up as a rough, grainy, detail-obscuring quality in the picture and are characterized by a measurement of signal-to-noise (S/N) ratio, much as with noise on audio cassettes.

Don't be misled into thinking that the small disparity in S/N ratio between standard and premium tapes (2 or 3 dB, as found in a test report or on a spec sheet) are insignificant. This magnitude of difference is visible, especially in a side-by-side comparison. Manufacturers will tell you—with some truth—that colors, particularly brilliant reds and yellows, tend to come out better when recorded on premium tape. Large expanses of color are (or should be) brighter, more vivid, and freer from mottling, and detail should appear more clearly, because of improved chroma and luminance S/N ratios, respectively. Certainly any tape-to-tape duplicate will look better if the videocassette used has a higher S/N ratio, because video noise builds up very rapidly with each generation of dubbing. Copies of the best source material (videodiscs and live TV broadcasts) also should look better with a higher grade of tape.

Videocassettes with excellent noise performance are obtained by several different methods, sometimes used in combination. Manufacturers may cull the standard-production output for tape batches having unusually low chroma and luminance noise;

extra milling procedures can be used to refine the magnetic particles in the tape coating; new and exotic materials, such as barium ferrite, can be included in the coating. The latter two processes produce smaller and more perfectly shaped (more elongated) magnetic particles better able to record video frequencies without adding noise.

Beware of any claims that a particular tape, premium or standard, provides improved detail. Strictly speaking, detail is a function of frequency response—the wider the better. But because of the frequency-modulation process used to record a videocassette, resolution is limited by the VCR. And a VCR's high-frequency abilities are restricted by the standardization of the recording format (Beta or VHS). All videotapes are capable of holding more detail than the recorders are providing. It takes a move away from the established recording standards, as in Super Beta VCRs, to obtain notably improved resolution. Any greater "detail" seen with premium-grade tapes is mainly the visual result of an improved luminance S/N ratio, hence the stress placed by manufacturers on reducing tape noise.

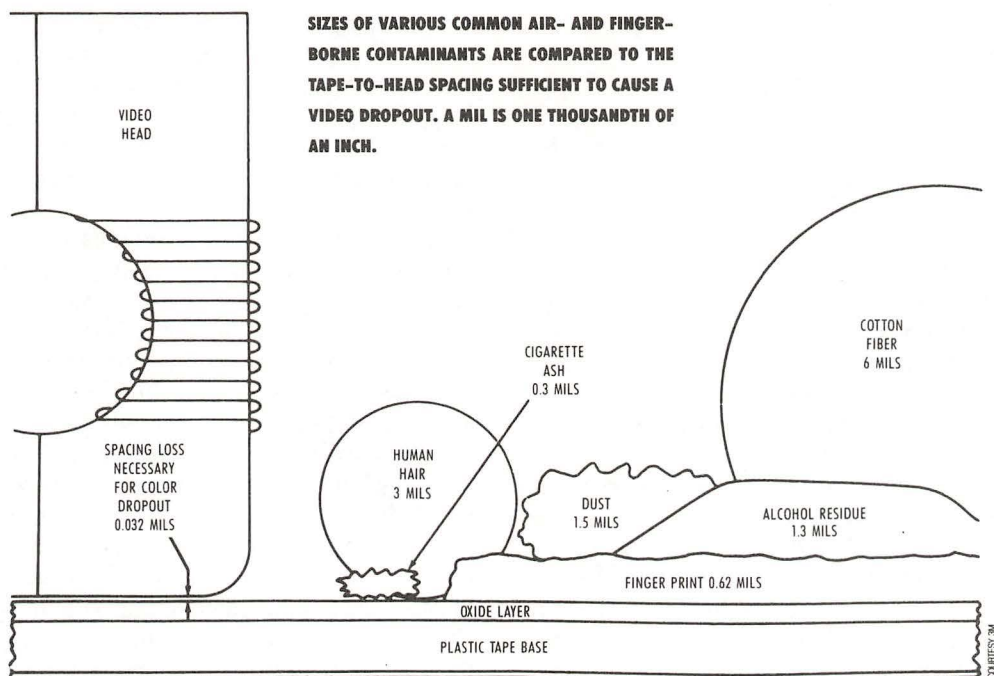
The other principal benefit of premium videocassettes—and one of the most significant improvements in all grades of tape in the past year or two—is a dramatic reduction in the number of dropouts, those pesky little white blips in the picture due to momentary losses of contact between the video heads and the tape surface. Dropouts are caused by a variety of ills, including airborne impurities embedded in the tape during the coating process, dust and debris attracted and held to the tape's surface by static electricity, and poor handling practices during the loading of the tape into shells. You can test

**COPIES OF THE BEST SOURCE MATERIAL SHOULD LOOK BETTER WITH A HIGHER GRADE OF VIDEOTAPE.**

for dropouts by making a recording of your VCR's composite-video input with no signal being fed (to obtain an all-black screen) and by then looking for white flashes and dots on playback. And you can get a feel for how sensitive tape is to impurities by looking at the diagram.

A low dropout count is visible (by being invisible), desirable, and thus attractively salable. Therefore, videocassette manufacturers have set about creating low-dropout premium tapes in several ways. One company, for example, inspects its regular run of tape, setting aside batches that exhibit unusually low dropout counts. Another has invested in additional clean-room equipment, while continuing to make its standard-grade tape nearby in a virtually identical facility lacking only the additional air scrubbers and sanitary procedures for the employees (special smocks, hair nets, and so forth). Several million dollars have been spent by 3M on research into the causes of and cures for static electricity,





and much of the knowledge gained has been applied to videotapes. At least one Japanese manufacturer has discovered that a switch from manual assembly to fully automated production leads to a sharp decline in dropouts—none of those humans to dirty things up. Nowadays, many makers combine several of these steps to achieve premium tapes that are nearly dropout-free, even at the problematic beginnings and ends of cassettes.

Unfortunately, a higher price and a fancier designation on the box do not guarantee that a tape has fewer dropouts than the same manufacturer's standard grade(s). In general, it's true that the costlier tape is better all around, but there are variations in dropout count from batch to batch, whether regular or premium. It's not unheard of for a very good standard-grade batch to meet or beat the dropout figures for an unusually poor run of premium tape from the same plant, although quality-control procedures are supposed to catch and reject the latter. Perhaps the best strategy is to buy tapes by the case, so that all the cassettes are from the same batch. If one tape is dropout-ridden, you can take the whole case back at once.

There's more to a premium-priced videocassette than on-screen performance. As mentioned above, static charges are a menace because they attract dust, which can stick to the tape or get caught on the video heads. "Besides acting as a magnet for dust and dirt," says Memorex Vice-President Joseph Petite, "[static electricity] also inhibits the free running of the tape inside the shell. That's not so important when you're recording on an AC-powered videocassette recorder, but it puts an extra strain on

the battery to keep a portable model operating at the proper speed. That in turn means shorter battery life for each charge—unless you remove the static electricity *inside* the cassette."

A number of manufacturers are actively combating the various forms of "static cling" by switching from flimsy cardboard or plastic cassette sleeves to durable plastic boxes that protect all six sides of the tape from dirt and by the introduction of antistatic techniques in the construction of the box, cassette shell, and internal cassette mechanism. For example, JVC's Kenji Awakura argues that two of the greatest generators of static electricity are the removal of the cellophane wrapping from the package and the very act of slipping a cassette out of its plastic sleeve. (How about that for a Catch-22!) The result in either instance is a static charge on the surface of the shell that can reach 50,000 volts. JVC's premium-tape response: a box with a lining in which are embedded particles of iron and carbon, both known for their ability to discharge static. A foil strip along the bottom edge of the spine is connected directly to the lining. When a user touches the strip, any static buildup inside the box flows through the foil and the body harmlessly to ground.

At two companies, 3M and Memorex, the approach has been slightly different. The two firms are using a new additive in the shells of their most expensive tapes that is designed to prevent static charges from accumulating in the first place. According to John Hakanson, 3M's resident authority on static electricity, in addition to producing antistatic shells, the company treats the internal parts of its cassette mechanisms to reduce static. This in-



cludes the tape itself, which is back-coated with a dull-finish antistatic compound. Memorex's latest premium cassettes contain tiny wire triggers inside the shell to drain off the charges that build up on the rollers as the tape passes.

More than static is being battled with the latest premium cassette shells. Joseph Petite takes the case (literally) of Memorex's Camera premium tape. "You'd expect a cassette used for recording in the field to be low in dropouts, to produce excellent colors, and to have good detail in the pictures. But then, you'd expect that of any videotape you pay extra for," he told me.

"Videocassettes used in the field take quite a beating," he continued. "For that reason, we have used a plastic [ABS] for our Camera cassette shells that is more durable and rugged than the high-impact styrene normally used in less expensive cassettes. And we've made the [shell] walls thicker to stand up to dropping and getting kicked around." There's also a Scotch videotape (EXG Camera) with components made of "high-impact plastic."

One application for which higher-than-standard-grade videotape is necessary is digital-audio recording on a VCR via a PCM adapter. Although you don't need a superior video S/N ratio for the recording to come out, you do need a tape with as few dropouts as possible. A dropout, which can look like a rather innocuous white dot or streak when superimposed on a video signal, can ruin a digital-audio recording by being decoded as a loud click or by causing a complete loss of the audio signal. Now, this criterion doesn't always imply a premium-priced tape—some standard-grade brands actually have fewer dropouts than the high-grade products of other manufacturers. However, when you do find a

**A HIGHER PRICE AND A FANCIER DESIGNATION DO NOT GUARANTEE THAT A TAPE HAS FEWER DROPOUTS THAN THE SAME MANUFACTURER'S STANDARD GRADE(S).**

producer whose standard tape is very free of dropouts, chances are that one of its premium ones will be better still. It may not even be the most expensive premium tape that company offers. In general, videocassettes labeled "Hi-Fi" tend to offer the best combination of performance and price, not only for PCM recording, but for Hi-Fi VCR and edge-track taping as well, since all are adversely affected by dropouts. Makers of PCM adapters all recommend a tape of "high grade" (one notch above standard) quality or better for digital recordings.

Although edge-track audio recording is now passé, having been thoroughly outclassed by the Hi-Fi processes, the analog-audio properties of a videocassette should not be ignored, particularly if you don't have a Hi-Fi VCR yet or if you make tapes for someone who doesn't. The characteristics that make a videocassette desirable for audio are the same as

those that are important for an audio cassette: an even coating free of dropouts, wide frequency response, low noise and distortion, and good headroom. An additional stereo consideration is that the left and right channels should provide equivalent performance. Since the right channel is recorded near the edge of the tape (up to the edge in the VHS system), any slitting variations or deformations in

**FOR DIGITAL-AUDIO RECORDING ON A VCR VIA A PCM ADAPTER, YOU NEED A TAPE WITH AS FEW DROPOUTS AS POSSIBLE.**

that area, no matter how slight, can affect the right-channel signal level and other sound characteristics. Problems of this

type are not a matter of tape price but instead vary from one manufacturer to another. Since the same equipment is used to slit a company's premium and standard videocassettes, it's likely that any aberrations in one grade will show up in the other.

Unfortunately, the engineering trade-offs involved in making a tape capable of simultaneously handling audio and video frequencies result in a compromise in the performance of both. Edge-track recording has never met high fidelity standards and probably never will, although prerecorded tapes can have fairly good analog sound with Dolby B encoding. And it's not clear that all premium videocassettes provide superior edge-track recordings, but their freedom from dropouts and probably better quality control should improve reliability.

The bottom line would seem to be what it has always been: caveat emptor. There are differences between standard and premium grades of tape, and they can be significant, depending on what you are shooting. Try the most durably packaged and dropout-free tape you can find for those once-in-a-lifetime live recordings (weddings, graduations, and the like). Another, slightly lower grade would be suitable for long-term archival storage and general tape and disc dubbing. Standard-grade tape is best used for ordinary time-shifting in which picture quality is not critical and for recording low-quality source material like old black-and-white movies and TV shows.

Some degree of brand loyalty is not inappropriate here, because of the way videotape is made. Oftentimes the same production line is used for all of a manufacturer's tapes, the main variations in grade being due to differences in magnetic coating and quality control. A company that's sloppy in producing its best tape is likely to be no better at it with its lesser grades. However, there may be cases in which a standard-grade will do the job better than the same manufacturer's premium products. The truth is that there is no single "best" tape for all uses: You're going to have to experiment with several grades and brand names for any specific application before you settle on the videocassette that consistently achieves results you like.

VS



# THE BEST CASSETTE

At-home tests help you pick which tapes work best with your deck.

BY DAVID RANADA

**T**he tape you use in a cassette deck will determine, to a great extent, how good a recording you will get. But this does not mean there is a single "best tape" for recording all program material on all machines. Instead, there are probably several best tapes for *your particular deck*, and they may not be the most expensive ones.

For top results, a tape must have magnetic characteristics matched to the bias and equalization of the recorder. Accordingly, the easiest (though not the most obvious) way to choose a cassette is to select a specific deck. An advanced model with a computer-controlled system of setting bias level, recording EQ, and sensitivity can adjust itself to the variations among tape brands and even among batches of the same brand and formulation. If the deck's designers have done their homework, the resulting match will be the optimum. In this way, a self-adjusting deck can free you to pick just about any cassette from any major brand without concern for compatibility. Models with manual trim controls for bias and sensitivity provide the same advantage, although they require more effort on your part. Either way, you are left to concentrate on other aspects of tape choice, such as price, performance, or whether the basic formulation is suitable for the music being recorded.

Finding the best matches for your deck, regardless of its controls and features, requires time, energy, and money. The time and the energy are used in a few home listening tests that will enable you to narrow your choices down to a few tapes in each major category. You'll therefore need at least one sample of each tape under consideration (that's where the money comes in). The tests assume that you have no control over your deck's recording characteristics (bias, EQ, sensitivity) and that you already know which type of tape is best for the kind of program material you're recording.

## THE OBJECTIVE

The goal of this enterprise is *not* the choice of a tape that "sounds good" but rather the selection of one that will make an *accurate* copy of the input—a dub as little changed from the original as possible. (Besides, according to some definitions of "high fidelity," a tape that is an accurate copy *does* sound good.) Sonic accuracy depends on three main aspects of tape performance: frequency response, noise, and distortion. The first is by far the most important.

Flat frequency response should be the result of all deck/tape pairings, but it is rare. Any deviation from flat response is undesirable, just as a basic principle of high fidelity, but it is particularly troublesome when recording on a cassette deck, where it can cause the noise reduction circuits to misbehave. The resulting "mistracking" can lead to noise pumping (the noise level behind the music rising and falling along with the signal) and breathing (the dynamics of the music changing unnaturally).

In fact, the audibility of these effects depends more on the flatness of the record/play response than on the basic noise "floor" of the tape (though that is important, too). The performance of all closed-loop noise reduction systems (such as Dolby B, Dolby C, and DBX) deteriorates in proportion to the recorder/tape combination's deviation from flat frequency response. If the response is flat, the noise reduction circuits can do their job well enough for recording levels to be kept low, minimizing distortion while still maintaining an adequate signal-to-noise (S/N) ratio.

## GETTING STARTED

An appropriate first step in choosing a cassette is simple but often overlooked: Read the deck's in-



struction booklet. Many manuals contain the manufacturer's recommendations for which tapes to consider, possibly even specifying those used for factory alignment of the deck. If nothing else, these recommendations can help narrow your shopping list to a manageable two or three brands in each category.

For each sample, use the proper bias and EQ settings. This usually involves adjusting one or two of the deck's front-panel switches, though many recent machines make these settings automatically. Switch

## TAPE CATEGORIES

THERE ARE THREE MAIN TYPES OF CASSETTE TAPE, AS DEFINED BY INTERNATIONAL (IEC) STANDARD AND CHARACTERIZED BY THE FORMULATIONS OF THEIR MAGNETIC COATINGS: TYPE 1 (STANDARD, NORMAL, FERRIC), TYPE 2 (CHROME, FERRICOBALT, OR, SOMETIMES, METAL), AND TYPE 4 (METAL). THE MISSING TYPE 3 IS THE FERRICHRONE FORMULATION, NOW FALLEN INTO DISUSE. IN THEORY, THE BEST ALL-AROUND TAPE IS THE TYPE 4, WHICH HAS PURE IRON PARTICLES AS ITS MAGNETIC MATERIAL. THESE TAPES USUALLY HAVE THE WIDEST DYNAMIC RANGE AND THE GREATEST HIGH-FREQUENCY RECORDING CAPACITY, IN ADDITION TO BEING THE MOST EXPENSIVE. IN PRACTICE, HOWEVER, THE TOP GRADES OF TYPE 1 OR TYPE 2 CAN COME VERY CLOSE TO EQUALING THE PERFORMANCE OF TYPE 4, ESPECIALLY IF THE DECK INCORPORATES DOLBY HX-PRO, WHICH WILL GIVE THEM MUCH BETTER HIGH-FREQUENCY PERFORMANCE.

FOR LIVE RECORDING, METAL TAPE IS PERHAPS THE BEST CHOICE BECAUSE IT AFFORDS THE GREATEST LEEWAY BEFORE OVERLOADING AND WILL THEREFORE GIVE YOU THE MOST PROTECTION FROM UNANTICIPATED PEAKS. GENERAL LP AND TAPE DUBBING WILL USUALLY NOT REQUIRE A TYPE 4. A FEW COMPACT DISCS WITH VERY WIDE DYNAMIC RANGE MAY BENEFIT FROM METAL, BUT ONLY IF YOU ARE USING NEITHER DOLBY HX-PRO NOR DOLBY C OR DBX. A HIGH-PERFORMANCE FERRIC MAY BE THE BEST CHOICE IF YOU WANT JUST ONE TYPE OF TAPE, SINCE THE PERFORMANCE OF A GOOD TYPE 1 IS VERY CLOSE TO THAT OF AN EQUALLY PRICED TYPE 2, AS OUR TAPE TESTS HAVE SHOWN (SEE "TESTING THE TAPES"), AND BECAUSE FERRICS ARE RECORDED WITH 120-MIKROSECOND EQUALIZATION, THEY ARE THE MOST NEARLY UNIVERSALLY PLAYABLE IN PORTABLE, CAR, AND OLD HOME CASSETTE DECKS.

off the deck's noise reduction systems; you'll be testing the tape, not the effectiveness of the noise reduction, at least to start. The next step, after making sure the deck is properly cleaned, is to gather the "test equipment." The minimum gear for most of the tests is a tuner or a receiver (as a source of FM interstation hiss) and a pair of headphones (so that you can hear small, low-level differences). More revealing evaluations are possible with a Compact Disc player and a CD test disc containing various test tones (pink noise, sine waves, etc.). This course is strongly recommended.

And don't forget to use your eyes. Yes, you can tell something about a tape's audible performance just by looking at it. The surface of the tape should be mirror-smooth, with no creases or bumps run-

ning from edge to edge or along its length; either is an indication of poor slitting and loading practices at the factory. If you have a brand-new cassette, fast-forward it to the end of Side A and look for creases put in the tape by its wrapping around the hub latch. Too tight a winding at the factory can cause permanent dropouts in the last minute or so of Side A, which is, more importantly, also the first minute or so of Side B. You don't have to reject a tape because of this fault—most have it—but you should not use the very beginning or end of a cassette for any tests or as the portion recorded on during a self-adjusting deck's alignment procedure.

Is the surface of the tape dished (concave) or bulging (convex)? Although no deformation would be ideal, a slightly concave surface is preferable to a convex one, which would indicate a tendency for the edges of the tape to pull away from the heads. The curvature is less important if the cassette's pressure pad supports the tape firmly over the entire surface (implying a fairly large and properly aligned pad). While you're looking at the pad, check to see that none of its fibers (if any) are fuzzing out over the surface of the tape, there to be caught between the tape and the heads.

## FLATTEST RESPONSE

Testing by ear for frequency-response flatness involves recording a steady noise signal: interstation hiss from FM or pink noise from a Compact Disc. If you have an analog tuner, dial it to a spot between stations; a digital tuner should be set to an unused FM channel. Switch off the muting to obtain the rushing hiss; the sound should be uncontaminated by distant stations, clicks, buzzes, and the like. If you have a CD player and a test disc, use a track containing wideband pink noise and program your player to repeat it indefinitely. (Interstation hiss sounds brighter than pink noise because it contains less low-frequency power. Either signal will serve for this evaluation.) Record a few minutes of noise on each tape at a level no higher than -15 dB on the meters. Do not change recording levels when changing tapes.

On playback through headphones, take advantage of the tape-monitor switch on your amplifier or receiver to compare the recorded hiss with the ongoing "live" hiss. If you have a three-head deck, use its source/tape-monitor switch to make the comparison while recording. Take care that the overall levels of live and recorded hiss are as closely matched as possible (though this may not be feasible with many decks and may require some fancy volume-knob twisting as you switch between source and tape). Beware of any tape that sounds, or reads on the deck's meters, noticeably louder or softer than



the original, as it may cause Dolby-type noise reduction systems to mistrack.

The tape that sounds most like the source has the flattest response on your deck. Pay particular attention to the very highest frequencies, which may be slightly reduced on playback. On the other hand, many of the premium-price Type 1 and Type 2 tapes have a designed-in treble *boost* that is applied when they are recorded and played with standard equalization curves on high-quality decks. Most recorders, built as they are to provide the standard curves, will reveal this boost. Unless your model has provisions to compensate for it (by slight overbiasing or by changes in the recording equalization), you might consider avoiding these tapes altogether, as they, too, can cause mistracking of the noise reduction systems. Some decks, however, may sound flatter with these tapes, in which case they should head to the top of your list.

#### LOWEST NOISE

One might think that a tape has its lowest noise right out of the case, before it is recorded on. That's true, but that doesn't represent actual performance. The lowest noise a tape will have in use is when a recording of silence is made on it. The resulting "bias noise" is *higher* than the cassette's brand-new or bulk-erased hiss level. To test for it, leave the deck connected to the audio system, switch the amplifier to the phono input (to prevent tuner signals from coursing around the system), turn down the deck's record-level controls all the way, and make a recording of several minutes of silence on each tape under evaluation. Then rewind the cassettes and listen to them through headphones with the volume control turned up fairly high.

Without noise reduction, the noise levels of all your samples will be high. Equal-grade (similarly list-priced) tapes from name-brand manufacturers will have just about equal levels. Many will be so close that a fair comparison—done by leaving the headphone volume the same while rapidly switching cassettes—will not reveal any significant differences. In that case, there are none. A lemon will stand out, however, as being much noisier. If you have trouble telling which tape has more hiss, you might switch in the Dolby B noise reduction system on playback. The noise won't totally disappear, but what remains on each cassette may be more easily differentiated because of the response shaping by the Dolby circuits.

#### LOWEST DISTORTION

Distortion is difficult to evaluate without test instruments, or at least without a generator or a CD

test disc to supply mid-frequency sine waves. One technique for assessing overall headroom is to keep recording at higher and higher levels the hiss used in the frequency-response tests. At some level, the tape will go into gross overload (saturation), drastically curtailing its high-frequency response and possibly causing its overall output level to drop. The higher the level can be turned before this occurs, the better. Music recorded at this level will not sound completely distorted, but will be noticeably compressed and possibly rolled off in the highs.

If you have access to sine waves, try taping a frequency between 300 and 500 Hz at a fairly hefty level (0 VU or above). Use the tape-monitor or source/tape switch to compare pure input with distorted output. The tape sounding most like the input has the least distortion. You can also hear modulation noise in this test as a kind of grittiness added to the original sine wave. This "asperity" noise is probably the major problem with all analog audio recording, and it is difficult to remove with noise reduction circuits. Tapes vary in their modulation-noise levels, but without test instruments, it is usually hard to tell which one has the least, at least at first. Practice in listening to recorded sine waves helps.

#### FINAL CHOICES

Some attention should be paid to the relative importance of each test. For example, if you plan to use Dolby C or DBX, the noise and distortion results are less important than those for frequency response. And if your deck has Dolby HX-Pro, the distortion test is the least important. Once you eliminate the truly bad tapes, you probably should go through the frequency-response test again with the noise reduction system of choice switched on.

After all this, you might find that there are no significant audible differences among the tapes tested. This is quite possible, especially if you're auditioning high-quality name-brand cassettes. The choice of a specific tape is then very simple: Any will do. Just buy a case or two and enjoy. Then again, if you are truly obsessed, you might want to test the cassettes for other aspects of performance: drop-outs (listen for any sudden changes in level during playback of hiss or, better yet, a 3-kHz sine wave); wow and flutter (the steadiness of pitch of a 3-kHz tone heard over speakers); channel-to-channel balance (there should be no change or drift in stereo image during the hiss playback over headphones); or tape winding (ideally, the tape "pack" should be smooth after fast-forward or rewind). Or you might want to check for one of my own pet peeves: whether the on-cassette labels are large enough. But if you get this far, maybe you should first see a psychiatrist.

VS



# TESTING THE TAPES

BY ROBERT LONG

Lab tests of 29 new cassette formulations reveal several surprises.

**P**aradox: On the one hand, we need to know exactly how tapes in general will behave if we're to predict how a deck will respond when you try recording on them; on the other hand, if all tapes are to respond in the same way, there can never be any improvement in them. For years, we have been editorializing on the need for tape standards so that the buyer of a new deck can know how to make it achieve its advertised specs and keep it performing at its best without periodic realignment as tapes change. But if you accept the claims of those who make tapes, change is always for the better. And that premise isn't without merit.

The catch is that the improvement is more likely to sound worse than better unless your deck is equipped to cope with it. This is because virtually all tape improvements involve increases in two factors that go hand in hand with lower distortion and noise (and therefore greater headroom, particularly at high frequencies, and dynamic range) plus more extended response at high frequencies. These two factors are coercivity and remanence, technical jargon for things that you'll never have to contend with directly but that have practical consequences you *do* have to deal with.

Increased coercivity requires more bias current than would be best for a comparable tape of lower coercivity. Without it, response will tend to peak at high frequencies, putting an unnatural edge on the sound. Similarly, the deck must compensate for the higher output level of a tape with increased remanence. Otherwise, Dolby tracking

(the exactitude with which playback decoding undoes the encoding that took place when you recorded the tape) can suffer audibly, though it might require many typical incremental changes before you would notice anything amiss unless you were specifically listening for it.

Over the last decade, the International Electrotechnical Commission (IEC), based in Europe, has addressed the problem head-on by rewriting its standards entirely and devising four generic reference tapes for use in testing recording equipment and against which all other tapes are to be compared. The IEC Type I is a ferric (sometimes called "standard," "normal," or "LN," for low noise, though all these terms are excessively vague or even misleading) that assumes use of 120-microsecond playback equalization and whose generic version actually is made by BASF. The company also manufactures the generic Type II—the reference for all chromium dioxide, ferricobalt, and comparable formulations intended for use with "high" bias (another potentially misleading term) and 70-microsecond EQ—though it is in fact a genuine chrome. Type III, ferrichrome, was on the way out before the standard ever got off the ground, and it's seldom provided for in current decks. IEC Type IV represents the metal-alloy tapes, for use with bias considerably higher than "high" but with the same EQ; the generic tape is made by TDK.

As the IEC standard took shape, it looked like a godsend in the anarchy of its time. Even before it won wide accep-

tance, we had adopted our own classifications, largely based on the IEC's. Ours deviated on only three points: We used Arabic numbering (Roman numerals are a constant source of printing errors); we added a Type 0 for older and less expensive ferrics requiring significantly less bias than the IEC's generic Type I (the distinction that had led us to yearn for a standard in the first place); and we based our approach on commercial tapes rather than on the generics, which were not yet available.

When we began testing cassette tapes two years ago, we adopted the IEC generics as the benchmarks for tape comparison in such characteristics as sensitivity and bias requirements. But the competitive forces at work within the tape industry have moved "real" tapes progressively farther from the IEC generics that represented the status quo at the moment of standardization. As a result, some of those who were quick to adopt the IEC standard wholesale as a criterion of merit for judging tapes have already abandoned it. We continue to use its definitions only as a way of comparing tapes with each other.

The first step in our procedure is to adjust bias for equal sensitivity at 333 Hz and 10 kHz for the tape under test. This doesn't necessarily yield very flat frequency response with the recording equalization built into the Nakamichi 582 (whose own tape-matching method is, in fact, significantly different). The resulting curve (recorded at 20 dB below the DIN 0-dB level of 250 nanowebers per meter) therefore must not be viewed as "response" but as



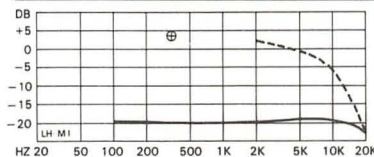
# BASF

BASF'S NEW SHELLS HAVE OVERSIZE WINDOWS AND INCORPORATE THE COMPANY'S SM (SPECIAL MECHANICS) GUIDE ARMS, WHICH ARE DESIGNED TO PROMOTE EVEN TAPE WIND ON THE HUB AND THEREFORE SMOOTH MOTION FROM THE SUPPLY HUB TO THE TAKE-UP SIDE. LABELING SPACE IS LARGER THAN AVERAGE, BUT NO REPLACEMENT LABELS ARE SUPPLIED. THE TWO FORMULATIONS TESTED HERE ARE FROM THE MAXIMA SERIES (THUS THE "M" IN THEIR RESPECTIVE DESIGNATIONS). THE TYPE-1 FERRIC MEASURES MUCH LIKE ITS PREDECESSOR, PRO I SUPER, THOUGH WITH SOME GAIN IN HEADROOM FOR EXTREME HIGHS AT THE EXPENSE OF THE MIDRANGE. THE TYPE-2 TAPE—ONE OF THE FEW THAT SHARES THE IEC REFERENCE TAPE'S CHROMIUM DIOXIDE MAGNETIC PARTICLE—IS NOTICEABLY HIGHER IN BIAS POINT AND SENSITIVITY THAN THE REFERENCE, AND IT ACHIEVES GREATER MIDRANGE AND LOWER-TREBLE HEADROOM THAN DOES THE COMPANY'S CHROMDIOXID EXTRA II (FORMERLY PRO II). THE TRUE CHROME TAPES REMAIN THE LOW-NOISE CHAMPIONS; THIS ONE MISSES THE ABSOLUTE RECORD ONLY BY AN INSIGNIFICANT MARGIN.



**BASF LH-MI C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

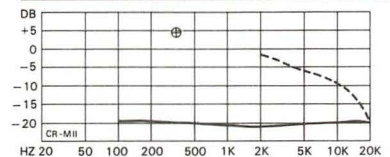


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+3 3/4 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		-1 1/2 dB
at 15 kHz		-12 1/2 dB
RELATIVE BIAS		114%
RELATIVE SENSITIVITY (333 Hz)		+1 1/2 dB
A-WEIGHTED NOISE (re 0 dB)		-55 1/4 dB
MIDRANGE S/N RATIO (re 3% THD)		59 dB
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.44%	0.13%
C-90 PRICE		\$2.79



**BASF CR-MII C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+4 1/2 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		-5 dB
at 15 kHz		-13 3/4 dB
RELATIVE BIAS		111%
RELATIVE SENSITIVITY (333 Hz)		+1 1/2 dB
A-WEIGHTED NOISE (re 0 dB)		-59 dB
MIDRANGE S/N RATIO (re 3% THD)		63 1/2 dB
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.05%	0.22%
C-90 PRICE		\$4.79

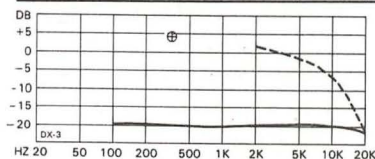
# DENON

DENON IS IN THE PROCESS OF REVAMPING ALL ITS FORMULATIONS. IT ALSO HAS REVISED ITS SHELL DESIGN TO PROVIDE A GENEROUSLY PROPORTIONED "PICTURE WINDOW." WE CHOSE TO TEST ALL BUT THE MIDDLE TYPE-2 FORMULATION (HD-7) OF THE NEW ONES NOW AVAILABLE. DX-3, DENON'S MIDDLE TYPE 1, PROVES A GOOD PERFORMER, ALTHOUGH WITH A SURPRISINGLY HIGH BIAS POINT. THE TOP TYPE 1, DX-4, OFFERS BETTER HEADROOM ACROSS THE BOARD AND A MORE CONVENTIONAL BIAS POINT, BUT IT CONCEDES TO DX-3 A MINUTE ADVANTAGE IN THE NOISE FIGURE. INDEED, NOISE IS THE ONLY RESPECT IN WHICH IT IS NOT BETTER THAN AVERAGE. HD-6 PROVES TO BE



**Denon DX-3 C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

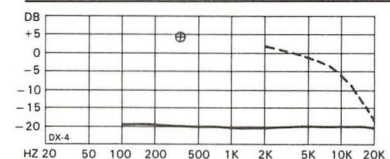


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+4 1/4 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		-1 1/2 dB
at 15 kHz		-14 dB
RELATIVE BIAS		125%
RELATIVE SENSITIVITY (333 Hz)		-1 1/2 dB
A-WEIGHTED NOISE (re 0 dB)		-54 1/4 dB
MIDRANGE S/N RATIO (re 3% THD)		58 1/2 dB
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.79%	0.15%
C-90 PRICE		\$3.75



**Denon DX-4 C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+4 1/2 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		-1 1/4 dB
at 15 kHz		-12 1/4 dB
RELATIVE BIAS		113%
RELATIVE SENSITIVITY (333 Hz)		+3/4 dB
A-WEIGHTED NOISE (re 0 dB)		-54 dB
MIDRANGE S/N RATIO (re 3% THD)		58 1/2 dB
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.65%	0.11%
C-90 PRICE		\$4.50



"relative sensitivity." That is, it is useful only in comparing tapes. If at a given frequency the curve for one tape is 2 dB higher than that for another tape, response will usually be 2 dB higher on most decks. (There can be some disparities occasioned by differences in the tape-coating thicknesses and deck-head construction.)

To use the relative sensitivity curves, you must determine what brands work well on your deck. Our equipment reports are designed to help you determine this. You should then look for similar behavior in other tapes tested here. Remember that the method used two years ago was identical, so comparisons between the two series of tests are valid. And once you have compared the sensitivity curves in this way, you can compare other characteristics in the same manner.

The curves' significance depends on the degree of adjustability of your deck. If its bias, recording equalization, and recording sensitivity all are variable, you should be able to use any of the tapes documented here. If its recording equalization can't be "tuned," look for like shape in the sensitivity curves, particularly in the range below 10 kHz; if bias can't be tuned either, look for similarity above 10 kHz as well and for bias figures within 5 or 10 percent (preferably less, particularly

among Type 1 and Type 2 tapes) of the figure for your known good brand. If there is no sensitivity adjustment and you expect to use Dolby noise reduction when recording, look for brands whose sensitivities measure within a few dB (preferably 1 dB) of that for your known brand.

Noise is tabulated in two ways. The deck's residual electronic noise is measured and subtracted from that of the tape after it has been recorded with no input signal (so that bias noise will be included). The result is shown as so many dB below the 0-dB reference. This figure enables you to compare the absolute noise levels that will be produced by the various tapes. If you always record the same way, making no allowance for differences in headroom, this noise figure is the one that best expresses the hiss you will hear. If, however, you do record "hotter" on formulations that will accept the higher levels, you will want to base your judgments instead on the S/N (signal-to-noise) figure, which adds the tape's midrange headroom to its raw noise figure. The larger the S/N ratio, or the more negative the noise measurement, the better, though differences of a dB or less aren't worth fussing over.

Diversified Science Laboratories (DSL) measures headroom in two ways. The midrange figure is simply

the level to which a 333-Hz tone can be recorded without exceeding 3-percent third harmonic distortion. This level is indicated on the graph by a "gunsight" symbol at 333 Hz, and the figure is shown again in the data below the graph. In the treble, the lab uses twin-tone intermodulation (again with a 3-percent limit) as its criterion, measuring at six frequencies: 2, 4, 6.3, 10, 15, and 20 kHz. A dashed curve is drawn through these data points on the graph, and the figures for 4 and 15 kHz are given in the data below it. These represent the limits beyond which recording can't be considered clean.

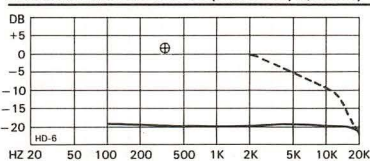
The higher (or less negative) these figures are, the better, though where you most need the headroom will depend on the sort of music you record. In general, jazz, synthesizer rock, and anything containing bell-like sounds are the most demanding at high frequencies. String orchestras probably are the least demanding of all standard musical fare in this respect and will be limited by midrange headroom alone. For a check on distortion at lower levels—where the bulk of music will be recorded in practice—there are figures for total harmonic distortion (actually, the sum of the second and third harmonic products) at DIN 0 dB and at a level 10 dB lower, both at 333 Hz.

The distortion figures (and there-



**Denon HD-6 C-90 cassette tape (Type 2)**

**PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)**

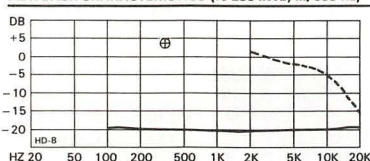


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+1 1/2 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-4 dB	
at 15 kHz	-15 1/2 dB	
RELATIVE BIAS	101%	
RELATIVE SENSITIVITY (333 Hz)	+ 1/4 dB	
A-WEIGHTED NOISE (re 0 dB)	-58 1/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	59 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	2.04%	0.28%
C-90 PRICE	\$4.00	



**Denon HD-8 C-90 cassette tape (Type 2)**

**PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)**



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+3 1/2 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-1 1/2 dB	
at 15 kHz	-10 1/2 dB	
RELATIVE BIAS	102%	
RELATIVE SENSITIVITY (333 Hz)	+2 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-54 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	58 1/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.35%	0.20%
C-90 PRICE	\$6.00	

AN EXCEPTIONAL MATCH TO THE TYPE-2 REFERENCE IN BIAS POINT AND SENSITIVITY. HOWEVER, IT HAS SLIGHTLY LESS DYNAMIC RANGE THAN AVERAGE AMONG ITS PEERS. HD-8, A METAL-PARTICLE TYPE 2, EXEMPLIFIES THE EXCELLENT HIGH-FREQUENCY HEADROOM OF ITS TYPE, BUT OFFERS SOMEWHAT LESS MIDRANGE DYNAMIC RANGE THAN AVERAGE. BIAS POINT IS ONLY A HAIR HIGHER THAN THE HD-6'S; SENSITIVITY IS NOTICEABLY HIGHER.



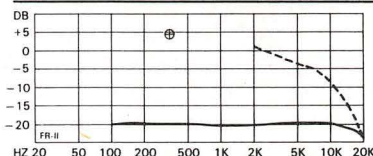
# FUJI

THIS COMPANY IS A LEADER IN CREATING SHELLS WHOSE A AND B SIDES CAN BE DISTINGUISHED BY FEEL ALONE. BOTH OF THE NEWEST TAPES ARE TYPE 2. THE FR-II SHELL HAS MOLDED BRAILLE SIDE INDICATIONS. THE TAPE INSIDE HAS GOOD MIDRANGE DYNAMIC RANGE. BOTH BIAS POINT AND SENSITIVITY ARE SOMEWHAT HIGHER THAN THOSE OF THE TYPE-2 REFERENCE TAPE. THE GT-II FORMULATION MEASURES ESSENTIALLY THE SAME AS THE FR-II, BUT IT IS SPECIALLY CONSTRUCTED TO WITHSTAND THE RIGORS OF USE IN AUTOMOBILES. ITS ABS SHELL—WHOSE ASYMMETRICAL DESIGN MAKES IT RELATIVELY EASY TO TELL A FROM B IN THE DARK—is RATED TO 230 DEGREES, AS ARE THE TAPE BASE AND BINDER. AND THE PRESSURE PAD IS MOUNTED ON A SHOCK-ABSORBING BIFURCATED SPRING.



**Fuji FR-II C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

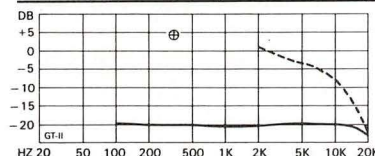


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+4 1/2 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-2 3/4 dB	
at 15 kHz	-16 dB	
RELATIVE BIAS	109%	
RELATIVE SENSITIVITY (333 Hz)	+1 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-57 1/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	61 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.82%	0.18%
C-90 PRICE	\$5.95	



**Fuji GT-II C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+4 1/4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-2 1/2 dB	
at 15 kHz	-15 dB	
RELATIVE BIAS	109%	
RELATIVE SENSITIVITY (333 Hz)	+1 1/4 dB	
A-WEIGHTED NOISE (re 0 dB)	-57 1/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	61 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.81%	0.14%
C-90 PRICE	\$7.45	

# KONICA

THOUGH THE KONICA NAME IS WELL KNOWN IN PHOTOGRAPHY, ITS ENTRY INTO TAPE (BY WAY OF VIDEOTAPE) IS QUITE RECENT. WE DECIDED TO TEST ALL CASSETTE FORMULATIONS EXCEPT A BUDGET FERRIC (ML), AND WE FOUND THEM ENTIRELY CONSISTENT WITH HIGH-QUALITY TAPES OF OTHER BRANDS. GM-II BELONGS TO THE "STANDARD" SUBGROUP OF TYPE 2, THAT IS, IT EVIDENTLY IS NOT MADE FROM A MODIFIED METAL-ALLOY POWDER. BIAS POINT IS A LITTLE BELOW THAT OF THE REFERENCE TAPE, SENSITIVITY A LITTLE HIGHER. MIDRANGE DYNAMIC RANGE IS GOOD. THE TYPE-4 TAPE IS AMONG THOSE REQUIRING EXTRA BIAS. IT DELIVERS BETTER MIDRANGE HEADROOM THAN AVERAGE AMONG THE PRESENT GROUP AND, PARTLY AS A RESULT, DYNAMIC RANGE IS EXCELLENT OVERALL.

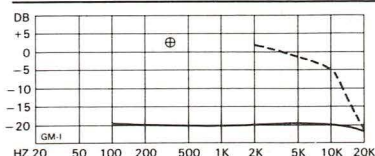
Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+3 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-1 1/2 dB	
at 15 kHz	-14 1/4 dB	
RELATIVE BIAS	110%	
RELATIVE SENSITIVITY (333 Hz)	-1 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-55 1/2 dB	
MIDRANGE S/N RATIO (re 3% THD)	58 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.95%	0.12%
C-90 PRICE	\$3.19	

RELATIVE BIAS	95%	
RELATIVE SENSITIVITY (333 Hz)	+1 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-57 1/2 dB	
MIDRANGE S/N RATIO (re 3% THD)	60 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.18%	0.17%
C-90 PRICE	\$3.59	



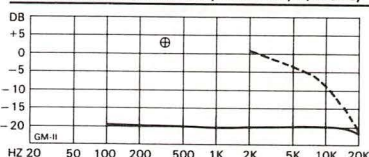
**Konica GM-I C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



**Konica GM-II C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

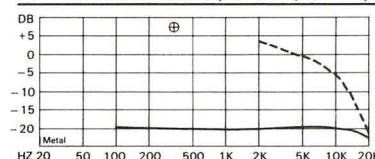


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+3 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-2 1/2 dB	
at 15 kHz	-15 1/4 dB	



**Konica Metal C-90 cassette tape (Type 4)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+7 1/2 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	+1 1/2 dB	
at 15 kHz	-12 3/4 dB	
RELATIVE BIAS	124%	
RELATIVE SENSITIVITY (333 Hz)	-1/4 dB	
A-WEIGHTED NOISE (re 0 dB)	-56 1/2 dB	
MIDRANGE S/N RATIO (re 3% THD)	64 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.50%	0.09%
C-90 PRICE	\$6.79	



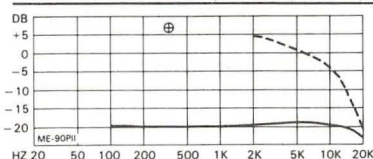
# JVC

THE ME-PRO TAPE, ORIGINALLY INTRODUCED AS ME PROFESSIONAL, IS NOW IN ITS SECOND GENERATION—AS ME-60P II (C-60 LENGTH) AND ME-90P II (C-90). THE SHELL REMAINS UNCONVENTIONAL, WITH A RELATIVELY LARGE WINDOW THAT RUNS VERTICALLY; LABELING SPACE, ON ONE END, IS CONSEQUENTLY RESTRICTED. DYNAMIC RANGE IS ABOUT AVERAGE FOR THE PRESENT TYPE-4 CROP, AS IS THE MIDRANGE HEADROOM. IN THE LOWER TREBLE, HEADROOM IS BETTER THAN AVERAGE. BOTH BIAS POINT AND SENSITIVITY ARE QUITE CLOSE TO THE REFERENCE-TAPE STANDARD.



**JVC ME-90P II C-90 cassette tape (Type 4)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+ 7 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	+ 1 3/4 dB	
at 15 kHz	- 11 3/4 dB	
RELATIVE BIAS	104%	
RELATIVE SENSITIVITY (333 Hz)	+ 1/4 dB	
A-WEIGHTED NOISE (re 0 dB)	-54 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	61 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.54%	0.10%
C-90 PRICE	\$16.95	

fore those for headroom) also depend on the deck's setting. For example, if you have a deck with less high-frequency pre-emphasis in the recording EQ than the Nakamichi, it may require less bias to deliver flat response and consequently yield higher distortion figures and lower midrange headroom. Higher bias, however, would not only reverse this formula but increase the tendency to self-erasure at high frequencies—reducing high-frequency headroom while improving the midrange. It is this interdependence of parameters that makes it impossible to improve tapes without risk of setbacks for some users.

In the past, some improvements were genuinely revolutionary: In particular, Du Pont's development of the chromium dioxide pigment and the appearance of metal-alloy tapes virtually simultaneously from all the major tape houses signaled radical innovation. But in recent years, change has been essentially evolutionary. The use of cobalt to modify the magnetic properties of gamma ferric oxide first made it possible to produce "chrome" (Type 2) tapes without chrome; then the technology was folded back upon itself to improve the previously all-ferric Type 1 tapes. Even before Type 3 ferrichromes (in which a chromium dioxide surface layer is added to a ferric foundation), layered tapes that combined different

magnetic pigments in successive coatings had eked out performance gains unavailable with either pigment alone.

At present, the emphasis is on managing the size, shape, and proportions of familiar particles to control their magnetic properties. That's how "Type 2" ferricobalt pigments have been adapted to make superior Type 1 tapes. The thrust continues in the newest Type 2 tapes using modified metal-alloy (Type 4) pigments. Several companies make tapes of this sort, usually touting them as the formulation of choice for copying digital recordings. As our data show, the reasonableness of this claim depends on the noise reduction system with which the copy will be made. The Type 2 metal tapes aren't particularly quiet, though they do have excellent high-frequency headroom and therefore should capture well the glittering transients that digital recording is so good at delivering.

Actually, the sleepers of the lot are the premium Type 1 tapes. They offer remarkable headroom—significantly better, on average, than that of regular Type 2 tapes throughout the frequency range and comparable to that of the metal Type 2 tapes in all but the extreme treble—together with low distortion. And their dynamic range is excellent, despite the inherent disadvantage of the "hissier" playback equalization, as long as you're pre-

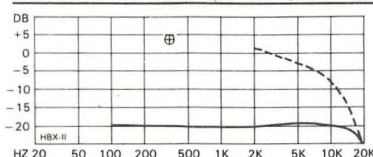
# MEMOREX

THE RECENT ENTRIES FROM MEMOREX (OR, MORE EXACTLY, MEMTEK, WHICH MAKES IT) ARE ALL FROM THE TYPE-2 GROUP. WE TESTED THE TWO TOP FORMULATIONS. HBX-II IS A "STANDARD" TYPE 2, BUT WITH ABOVE-AVERAGE HEADROOM FOR THAT GROUP IN BOTH THE MIDRANGE AND LOWER TREBLE. OTHERWISE, IT'S A PRETTY CLOSE MATCH TO THE AVERAGE OF ALL TYPE-2 TAPES TESTED THIS TIME AROUND. BIAS POINT AND SENSITIVITY BOTH ARE SIGNIFICANTLY HIGHER THAN THOSE OF THE TYPE-2 REFERENCE TAPE. CDX-II IS DESIGNED TO COPE WITH THE DYNAMIC RANGE OF CDS (HENCE THE NAME) AND USES A METAL-PARTICLE COATING TO THIS END. IT OFFERS SIGNIFICANTLY MORE HIGH-FREQUENCY HEADROOM THAN HBX-II, BUT ITS HIGHER INTRINSIC NOISE LEVEL YIELDS LESS MIDRANGE DYNAMIC RANGE DESPITE THE EXCELLENT MIDRANGE HEADROOM. BIAS POINT ACTUALLY IS A HAIR BELOW THAT OF THE TYPE-2 REFERENCE; SENSITIVITY IS CONSIDERABLY GREATER.



**Memorex HBX-II C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

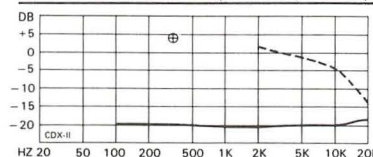


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-1 3/4 dB	
at 15 kHz	-16 1/4 dB	
RELATIVE BIAS	112%	
RELATIVE SENSITIVITY (333 Hz)	+1 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-57 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	61 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.09%	0.22%
C-90 PRICE	\$4.79	



**Memorex CDX-II C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+ 4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	- 3/4 dB	
at 15 kHz	-9 1/2 dB	
RELATIVE BIAS	99%	
RELATIVE SENSITIVITY (333 Hz)	+ 3 dB	
A-WEIGHTED NOISE (re 0 dB)	-54 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	58 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.24%	0.17%
C-90 PRICE	\$5.49	



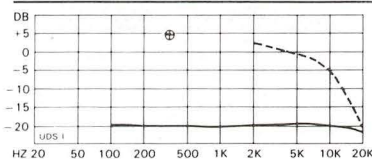
# MAXELL

MAXELL HAS REDONE ITS WHOLE LINE SINCE LAST YEAR, SO WE TESTED ALL THE NEW FORMULATIONS EXCEPT UR (REPLACING LN AS THE BUDGET TYPE 1) AND THE SUPERPREMIUM XL-IS AND XL-IIS (WHICH MAXELL SAYS ARE LESS SIGNIFICANTLY CHANGED SINCE OUR LAST TEST THAN THE REMAINDER). UD HAS BEEN REPLACED BY UDS-I, WHOSE PORELESS FERRICRYSTAL PIGMENT YIELDS EXCELLENT HEADROOM AND EXTREMELY LOW NOISE, FOR A DYNAMIC RANGE THAT EASILY RIVALS THAT OF TYPE-2 TAPES. XL-I, WHICH FITS BETWEEN UDS-I AND XL-IS IN THE PANTHEON, CAPS AN EXCELLENT HEADROOM CURVE WITH A SUPERB MIDRANGE FIGURE (BETTERED IN OUR TYPE-1 TESTS ONLY BY XL-IS IN 1983). BUT XL-I'S HIGHER NOISE GIVES A SLIGHT EDGE TO BOTH XL-IS AND UDS-I IN OVERALL DYNAMIC RANGE. UDS-II FITS COMFORTABLY INTO THE MOLD OF STANDARD (NONMETAL) TYPE-2 TAPES, WITH GOOD MIDRANGE DYNAMIC RANGE AND SOMEWHAT HIGH BIAS POINT AND SENSITIVITY BY COMPARISON WITH THE REFERENCE TAPE. XL-II (WHICH REPLACES UDXL-II) IMPROVES ON UDS-II'S DYNAMIC RANGE, DESPITE A SLIGHTLY HIGHER NOISE FIGURE, BECAUSE ITS MIDRANGE HEADROOM IS SIGNIFICANTLY GREATER. ITS BIAS POINT IS LOWER THAN UDS-II'S, ITS SENSITIVITY HIGHER. HEADROOM OF THE NEW MX IS BETTER THAN AVERAGE AMONG THIS YEAR'S TYPE-4 TAPES, YIELDING GOOD DYNAMIC RANGE. IT IS IN THE LOW-BIAS TYPE-4 GROUP, WITH SENSITIVITY REASONABLY CLOSE TO THAT OF THE REFERENCE TAPE.



**Maxell UDS-I C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

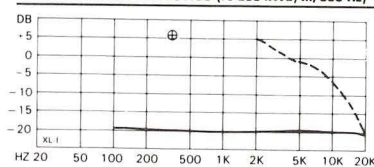


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+4 3/4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	+ 1/4 dB	
at 15 kHz	-13 dB	
RELATIVE BIAS	107%	
RELATIVE SENSITIVITY (333 Hz)	-1 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-55 1/2 dB	
MIDRANGE S/N RATIO (re 3% THD)	60 1/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.51%	0.10%
C-90 PRICE	\$3.99	



**Maxell XL-I C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

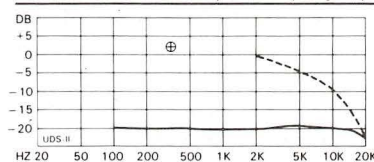


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+5 3/4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	0 dB	
at 15 kHz	-13 dB	
RELATIVE BIAS	110%	
RELATIVE SENSITIVITY (333 Hz)	+ 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-53 dB	
MIDRANGE S/N RATIO (re 3% THD)	58 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.36%	0.14%
C-90 PRICE	\$4.99	



**Maxell UDS-II C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

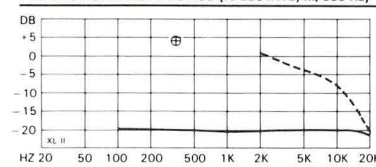


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+2 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-3 1/2 dB	
at 15 kHz	-15 3/4 dB	
RELATIVE BIAS	104%	
RELATIVE SENSITIVITY (333 Hz)	+1 dB	
A-WEIGHTED NOISE (re 0 dB)	-58 dB	
MIDRANGE S/N RATIO (re 3% THD)	59 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.78%	0.34%
C-90 PRICE	\$3.99	



**Maxell XL-II C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

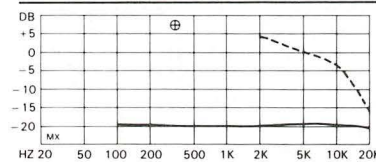


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-2 3/4 dB	
at 15 kHz	-14 dB	
RELATIVE BIAS	100%	
RELATIVE SENSITIVITY (333 Hz)	+2 dB	
A-WEIGHTED NOISE (re 0 dB)	-56 1/2 dB	
MIDRANGE S/N RATIO (re 3% THD)	60 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.92%	0.18%
C-90 PRICE	\$4.99	



**Maxell MX C-90 cassette tape (Type 4)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+7 1/2 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	+1 1/4 dB	
at 15 kHz	-9 1/2 dB	
RELATIVE BIAS	97%	
RELATIVE SENSITIVITY (333 Hz)	+3/4 dB	
A-WEIGHTED NOISE (re 0 dB)	-55 dB	
MIDRANGE S/N RATIO (re 3% THD)	62 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.48%	0.11%
C-90 PRICE	\$7.99	

pared to record at levels high enough to make full use of the available headroom. Some even cost less than their Type 2 counterparts. The Type 4 tapes do outstrip them, on average, in midrange headroom, but the difference is shockingly small in the treble, where metal is supposed to be the particle of choice. Only the Type 2 metal-based tapes actually demonstrate this advantage, significantly outperforming the Type 4 group in the extreme highs, with about 6-dB-greater average head-

room at 20 kHz. This result is perhaps the biggest shocker of all.

A comparison of averages in the current tape group with those of our tests two years ago is instructive—and a little surprising. Among the Type 1 tapes, the average bias point has crept from 106 percent of that required for the IEC reference tape to 111 percent, which is about what we would have expected. Given the emphasis some manufacturers put on output level, we figured that the sensitivity would have



# SONY

IN RECENT YEARS, THE COMPANY HAS COMPLETELY REMODELED ITS CASSETTE TAPES. ALL HAVE NOW BEEN GIVEN SHELLS WITH HUGE WINDOWS; THE LEAST EXPENSIVE (HF) ACTUALLY IS HOUSED IN A TOTALLY TRANSPARENT SHELL. ALL BUT HF HAVE A NEW HUB DESIGN AND A RAISED "A" THAT DISTINGUISHES THAT SIDE FROM SIDE B BY TOUCH. THE STICK-ON LABELS ARE A LITTLE SMALLER THAN AVERAGE. AS A BUDGET TAPE, HF IS PERHAPS A LITTLE OUT OF ITS DEPTH IN THE PRESENT COMPANY. ITS VERY LOW BIAS REQUIREMENT AND SENSITIVITY, HOWEVER, MAY MAKE IT WELL SUITED TO SOME DECKS THAT CAN'T COPE WITH MOST CURRENT PREMIUM TAPES. BUT ITS RELATIVELY RESTRICTED HEADROOM AND DYNAMIC RANGE SUGGEST THAT SONY DESIGNED IT AS A UTILITY TAPE RATHER THAN AS A TRUE PERFORMANCE PRODUCT. HF-S IS MUCH MORE TYPICAL OF THE MAJOR TYPE-1 TAPES AND RESEMBLES SONY AHF, WHICH IT EVIDENTLY IS DESIGNED TO REPLACE. DYNAMIC RANGE IS IN THE CHAMPIONSHIP CLASS, THOUGH ONLY A HAIR BETTER THAN THAT OF AHF—WHICH, UNLIKE HF-S, NEEDED MORE BIAS THAN MANY NONADJUSTABLE DECKS SUPPLY. UCX-S IS A "STANDARD" TYPE-2 TAPE, WITH A BIAS REQUIREMENT THAT CLOSELY MATCHES THAT OF THE REFERENCE, BUT WITH SLIGHTLY HIGHER SENSITIVITY. HIGH-FREQUENCY HEADROOM IS SOMEWHAT IMPROVED RELATIVE TO UCX (TESTED IN 1983), BUT OTHER CHARACTERISTICS DON'T MEASURE QUITE AS WELL. BIAS ALMOST EXACTLY EQUALS THAT OF THE TYPE-2 REFERENCE; SENSITIVITY IS SIGNIFICANTLY HIGHER. METAL-ES IS A REAL WINNER AMONG THE TYPE-4 TAPES. ITS BIAS POINT AND SENSITIVITY ARE HIGHER THAN THOSE OF THE REFERENCE, BUT NOT BY MUCH. MIDRANGE HEADROOM IS SUPERB—THE BEST OF ANY TAPE ASSESSED THIS TIME AROUND—AND OVERALL DYNAMIC RANGE IS THE BEST WE'VE EVER MEASURED, AT 66 1/4 DB. TREBLE HEADROOM IS A HAIR ABOVE AVERAGE FOR THIS YEAR'S TYPE-4 TAPES AT THE EXTREME TOP, A HAIR BELOW IN THE LOWER TREBLE.

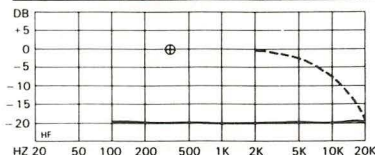
risen as well, but it still averages just below that of the reference tape. There is a slight improvement in headroom at around 2 kHz, but the remaining averages are almost identical.

For the Type 2 tapes, the average bias point has jumped from 96 to 103 percent of the reference, while sensitivity has nudged up only 1/4 dB, to +1 3/4 dB. Average distortion, headroom, and noise figures remain almost unaltered. If one looks only at the averages, the Type 4 group also appears to have



**Sony HF C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

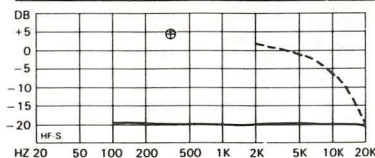


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	0 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-1 1/2 dB	
at 15 kHz	-12 3/4 dB	
RELATIVE BIAS	86%	
RELATIVE SENSITIVITY (333 Hz)	-1 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-52 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	52 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	2.87%	0.20%
C-90 PRICE	\$3.15	

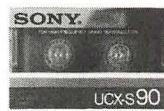


**Sony HF-S C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

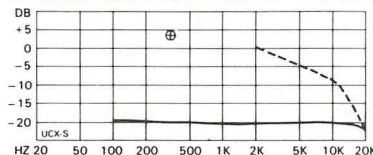


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+4 1/2 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	0 dB	
at 15 kHz	-12 1/4 dB	
RELATIVE BIAS	107%	
RELATIVE SENSITIVITY (333 Hz)	0 dB	
A-WEIGHTED NOISE (re 0 dB)	-56 1/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	60 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.48%	0.13%
C-90 PRICE	\$4.25	



**Sony UCX-S C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

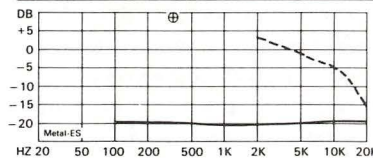


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+3 1/2 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		-3 1/2 dB
at 15 kHz		-15 1/2 dB
RELATIVE BIAS		101%
RELATIVE SENSITIVITY (333 Hz)		+2 dB
A-WEIGHTED NOISE (re 0 dB)		-57 1/4 dB
MIDRANGE S/N RATIO (re 3% THD)		60 3/4 dB
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.10%	0.22%
C-90 PRICE		\$7.00



**Sony Metal-ES C-90 cassette tape (Type 4)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+8 3/4 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		0 dB
at 15 kHz		-7 1/2 dB
RELATIVE BIAS		108%
RELATIVE SENSITIVITY (333 Hz)		+1 1/2 dB
A-WEIGHTED NOISE (re 0 dB)		-57 1/2 dB
MIDRANGE S/N RATIO (re 3% THD)		66 1/4 dB
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.26%	0.07%
C-90 PRICE		\$11.50

changed little, except that sensitivity is up a whopping 3 1/4 dB. But averages may be misleading here. Two years ago, the metals fell into two distinct groups, characterized by bias points of about 95 and 125 percent, respectively, relative to the Type 4 reference. This time, the lines aren't so clearly drawn, though the metals still cover a wider spectrum than either the Type 2 or the premium Type 1 tapes. And none of the present Type 4 tapes really fits the average.

One conclusion is unavoidable, however: The evolution documented by our data isn't nearly as radical as those who created it would have us believe. And this is in spite of the tape industry's tendency to move as a unit, a tendency resulting from the fact that some important developments occur at the few companies producing the raw magnetic powder, rather than at the many actually manufacturing tape from it (to say nothing of the legion that market tape made by others).



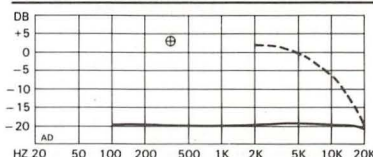
# TDK

THE LABELING SPACE ON TDK CASSETTES IS MORE EXTENSIVE THAN AVERAGE, BUT THE COMPANY'S APPROACH TO SHELL DESIGN AND PACKAGING IS AS CLOSE TO A STANDARD AS IT'S POSSIBLE TO COME. THIS GENERATION OF AD PROVES TO BE QUITE SIMILAR TO WHAT WE TESTED IN 1982, WHICH IS TO SAY THAT IT'S AN EXCELLENT TYPE-1 TAPE. LIKEWISE, THE CURRENT SA CLOSELY RESEMBLES THE PREVIOUS (1983) SA—AND IS THEREFORE TYPICAL OF "STANDARD" TYPE-2 TAPES—BUT HAS INCREASED HEADROOM AT VERY HIGH FREQUENCIES AND A SLIGHTLY LOWER NOISE FLOOR. BIAS POINT IS ONLY A TRIFLE HIGHER THAN THAT OF THE REFERENCE TAPE, AND SENSITIVITY IS SIGNIFICANTLY HIGHER. HX-S WAS THE FIRST OF THE METAL-PARTICLE TYPE-2 FORMULATIONS AND IS A PARTICULARLY FINE REPRESENTATIVE OF ITS SORT. MID-RANGE DYNAMIC RANGE STILL ISN'T QUITE THE EQUAL OF SA'S, HOWEVER. BIAS POINT IS SOMEWHAT HIGHER THAN THAT OF THE REFERENCE; SENSITIVITY IS CONSIDERABLY GREATER.



**TDK AD C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

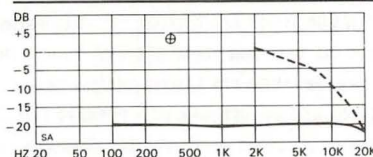


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+ 3 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	+ 1 dB	
at 15 kHz	-13 dB	
RELATIVE BIAS	110%	
RELATIVE SENSITIVITY (333 Hz)	- 3/4 dB	
A-WEIGHTED NOISE (re 0 dB)	-55 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	58 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.83%	0.09%
C-90 PRICE	\$3.30	



**TDK SA C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+3 1/4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	-2 3/4 dB	
at 15 kHz	-16 dB	
RELATIVE BIAS	101%	
RELATIVE SENSITIVITY (333 Hz)	+1 1/2 dB	
A-WEIGHTED NOISE (re 0 dB)	-57 1/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	60 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.13%	0.21%
C-90 PRICE	\$3.70	

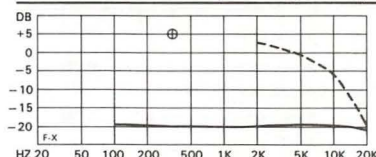
# TRIAD

THE TRIAD BRAND IS NEW TO THE U.S., THOUGH IT HAS BEEN AVAILABLE FOR SOME TIME (AS "THAT'S" TAPE) ELSEWHERE. IT'S MADE BY TAIYO YUDEN CO. OF JAPAN—A LONGTIME SUPPLIER OF FERRITE PRODUCTS FOR ELECTRONICS (THE ROUTE BY WHICH TDK ALSO ENTERED TAPE MANUFACTURE)—AND IS SOLD HERE BY HARMAN AMERICA. THE SHELLS HAVE A TRIANGULAR WINDOW WHOSE APEX IS NEAR ONE HUB, MAKING THE USEFUL AREA SMALLER THAN AVERAGE IN SOME DECKS. THE HUB IN QUESTION IS FOR TAKE-UP ON SIDE A AND SUPPLY ON SIDE B, MAKING IT POSSIBLE (BUT ONLY JUST) TO DISTINGUISH SIDES BY FEEL ALONE. LABELING SPACE ON THE BOX INSERT CARD IS AT LEAST AS GENEROUS AS MOST; THAT ON THE SHELL LABELS IS VERY RESTRICTED. IF YOU SUBSTITUTE FILE-FOLDER LABELS (A COMMON PRACTICE AMONG SERIOUS RECORDISTS), THEY COVER THE TYPE DESIGNATION. FX HAS EXCELLENT HEADROOM AND IS SPOT-ON REFERENCE SENSITIVITY, MAKING IT AN EXCEPTIONALLY ATTRACTIVE TYPE-1 TAPE. THE BIAS POINT IS UNUSUALLY HIGH, HOWEVER, WHICH COULD POSE PROBLEMS IN NONADJUSTABLE DECKS. EM-X IS QUITE REPRESENTATIVE OF METAL-PARTICLE TYPE-2 FORMULATIONS. BIAS ACTUALLY IS A LITTLE BELOW THAT OF THE TYPE-2 REFERENCE, AND SENSITIVITY IS SIGNIFICANTLY HIGHER. MG-X PROVES TO BE FAIRLY TYPICAL OF TYPE-4 TAPES, PARTICULARLY THOSE THAT REQUIRE CONSIDERABLY MORE BIAS THAN THE REFERENCE TAPE.



**Triad F-X C-90 cassette tape (Type 1)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)

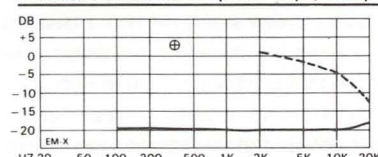


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+ 5 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		+ 1 1/2 dB
at 15 kHz		-13 dB
RELATIVE BIAS		126%
RELATIVE SENSITIVITY (333 Hz)		0 dB
A-WEIGHTED NOISE (re 0 dB)		-54 1/2 dB
MIDRANGE S/N RATIO (re 3% THD)		59 1/2 dB
THD (at 333 Hz)		
	at 0 dB	at -10 dB
	0.31%	0.11%
C-90 PRICE		\$3.39



**Triad EM-X C-90 cassette tape (Type 2)**

PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)



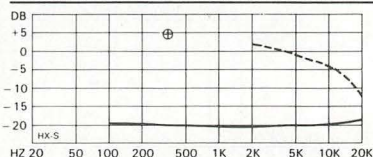
Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)		+ 3 dB
----- Maximum high-frequency output (3% IM):		
at 4 kHz		-1 dB
at 15 kHz		-8 1/2 dB
RELATIVE BIAS		97%
RELATIVE SENSITIVITY (333 Hz)		+ 2 3/4 dB
A-WEIGHTED NOISE (re 0 dB)		-55 3/4 dB
MIDRANGE S/N RATIO (re 3% THD)		58 3/4 dB
THD (at 333 Hz)		
	at 0 dB	at -10 dB
	1.60%	0.21%
C-90 PRICE		\$3.99





**TDK HX-S C-90**  
cassette tape  
(Type 2)

**PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)**

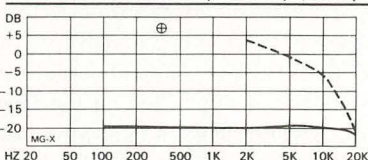


Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+ 4 3/4 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	- 1/4 dB	
at 15 kHz	-8 dB	
RELATIVE BIAS	107%	
RELATIVE SENSITIVITY (333 Hz)	+ 3 dB	
A-WEIGHTED NOISE (re 0 dB)	-54 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	59 1/2 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	1.06%	0.17%
C-90 PRICE	\$7.00	



**Triad MG-X C-90**  
cassette tape  
(Type 4)

**PLAYBACK CHARACTERISTICS (re 250 nWb/m, 333 Hz)**



Relative output vs. frequency (at -20 dB)		
⊕ Midrange headroom (3% THD)	+ 7 dB	
----- Maximum high-frequency output (3% IM):		
at 4 kHz	+ 1/4 dB	
at 15 kHz	-12 3/4 dB	
RELATIVE BIAS	119%	
RELATIVE SENSITIVITY (333 Hz)	- 1/4 dB	
A-WEIGHTED NOISE (re 0 dB)	-55 3/4 dB	
MIDRANGE S/N RATIO (re 3% THD)	62 3/4 dB	
THD (at 333 Hz)	at 0 dB	at -10 dB
	0.54%	0.11%
C-90 PRICE	\$4.59	

That's why several tape companies often announce almost simultaneously what proves to be the same development. But change is appreciable, if not dramatic. It may not be extreme enough to significantly enhance or compromise the performance of a deck whose recording abilities were only fair with previous tapes, but it is enough to downgrade performance from superb to only good on a deck that can't compensate for the deviation.

Keep in mind that we're measuring only major brands here—and not even all of them: Scotch, having introduced its new line too late for this series of tests, isn't represented. Each tape is made by a company that has devoted major resources to both research and production, though the producing company isn't necessarily the one whose name appears on the packaged cassette. When DSL has looked at off-brand tapes, the results have regularly been out of this league altogether. That is, the differences between the major brands and the off-brands usually are dramatic by comparison with the differences of a dB here or a percentage point there that you will find in the data that follow.

A moral of this is that you shouldn't place too much emphasis on the differences you find in the data, which in many cases border on insignificance. Some small differences might even be erased or reversed if the lab were to repeat the tests with different samples: The numbers simply aren't absolutes. But you shouldn't assume that brand makes no difference just because these are so similar. Buy several and compare them by ear. On careful listening, with almost any deck, you'll probably hear differences.

Two of DSL's tests don't appear as data. In one, the vertical scale of a playback sweep is expanded to dramatize any amplitude irregularities or instability. For the most part, the results were superb, with the least impressive (for Sony HF, the most inexpensive tape in the company's current line) still far smoother than the Grand Teton raggedness that has emerged in this test with off-brand tapes. In the other test, DSL corrects the deck's azimuth for any tape skew that occurs. In a perfect cassette with a well-designed, preci-

sion-molded shell, there should be no skew. The degree of correction involved therefore is an index of shell quality. None of the tapes in this batch needed more than minor azimuth adjustment. Though some needed more than others, it seemed to vary more from sample to sample than from brand to brand. We doubt that this excellence would have been sustained had we included off-brands.

The cassettes we tested are, physically as well as magnetically, more notable for their similarities than for their differences. All shells guide the tape with idler wheels (not just guide posts, whose higher friction can cause problems) at the front corners, and all have windows that are larger than the one in the original Philips shell. The standard size now is about 1/2 by 1 inch, though some brands have much bigger windows, as documented in the individual reports. And all have five-screw shell closures, enabling you to make repairs and reassemble the shell afterward, if you're handy, which you can't do with welded shells. All except BASF's have pressure-sensitive shell labels that can be typed on and then applied, for a neat, finished appearance. And all have insert cards that are very generous (though least so for Sony's budget HF formulation) in box-labeling space.

A unique feature of the Triad shell is a set of printed specs for bias, sensitivity, headroom, and high-frequency response. Although we don't know how these numbers were arrived at (they're mostly in the ball park with our test results, but some are over toward left field), they suggest a way of telling buyers how the best use can be made of these tapes. I'm enough of an optimist to hope that this approach might be standardized and applied responsibly by all major manufacturers. If you choose to consider the idea utopian, I won't argue.

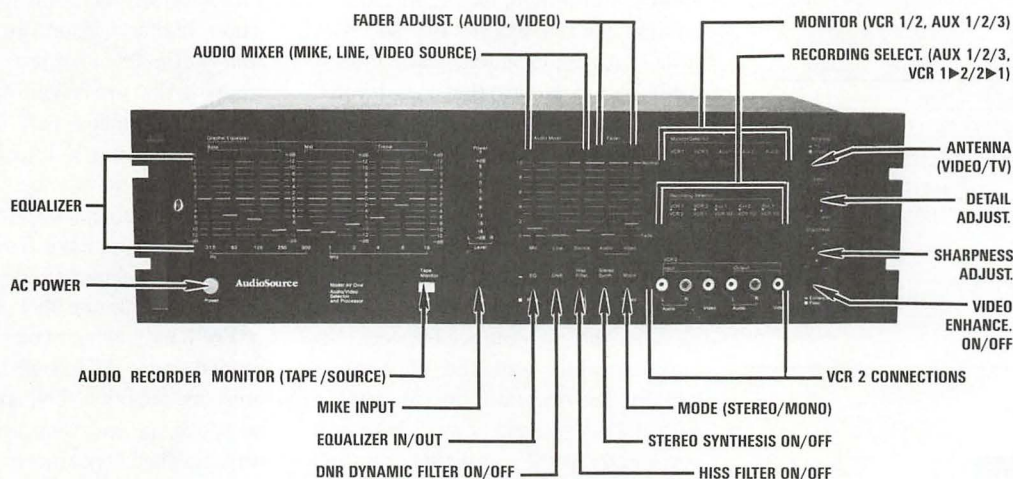
Finally, compare with caution the list prices we show. No other high fidelity product is subject to such a wide price spread from region to region, from store to store, and even from time to time. List prices are most helpful in gauging relative costs within a given brand, but they can be misleading for comparisons between brands if one is heavily discounted in your area and the other is not.

vs



# TEST REPORTS

## Audiosource AV-One Audio-Video Switcher/Processor



**DIMENSIONS:** 19 BY 5½ INCHES (FRONT), 7½ INCHES DEEP PLUS CLEARANCE FOR RACK HANDLES AND CONNECTIONS. **PRICE:** \$580. **WARRANTY:** "LIMITED," ONE YEAR PARTS AND LABOR. **MANUFACTURER:** MADE IN JAPAN FOR AUDIOSOURCE, INC., 1185 CHESS DR., FOSTER CITY, CALIF. 94404.

If your video system is growing like Topsy and matters are getting out of hand, Audiosource's AV-One may be just what you're looking for. It's an exceptionally versatile audio-video switcher with extensive dubbing facilities and features for processing both picture and sound either before or after copying.

The unit can handle as many as five audio-video sources, with separate monitor and recording selector banks (so that you can watch and listen to what you're recording or not, as you see fit). The monitor selector is labeled for two VCRs and three auxiliary video sources: a videodisc player, a component TV tuner, a video game, or what have you. If you have a video monitor, you can connect it directly to the monitor output; if not, the AV-One has an RF modulator that sends the video and audio out together on either Channel 3 or Channel 4, enabling you to use the unit with a conventional television set. An antenna button switches the RF feed to your TV between your antenna (or cable) and the modulator.

The recording selector provides options for dubbing from VCR 1 to VCR 2 or vice versa and from any of the three aux inputs to either or both of the VCRs. VCR 2's input and output connections are duplicated on the front panel, which makes a temporary lash-up as easy as pie. The front-panel jacks take priority over the back-panel ones, so you can leave a second VCR permanently connected and hook up a friend's temporarily without digging around in back.

The audio program is switched along with the video, and except when carried on the RF modulator, it is in stereo. If your program source is mono, you can either switch to the mono mode with the mono/stereo button or generate pseudo stereo by engaging the stereo synthesizer. Audiosource suggests that you can use this circuit even with a stereo source, but we see little point in doing so. Diversified Science Laboratories' tests indicate that the circuit Audiosource uses routes frequencies below 1.5 kHz to the right channel and the higher fre-



quencies to the left, with some phase shift between the two to widen the image. We prefer the comb-filter approach to synthetic stereo, although no pseudo-stereo technique approaches the real thing.

Synthetic stereo is the least of the audio goodies the AV-One has to offer. Most prominent is a ten-band graphic equalizer that can be used to tailor the program to which you're listening or to spruce up a copy while it is being made. Each slider handles an octave band, the lowest being centered on 31.5 Hz and the highest on 16 kHz. DSL's tests indicate that the frequency markings are accurate enough for practical purposes and that the control ranges vary from a minimum of  $\pm 11\frac{1}{2}$  dB to a maximum of  $\pm 13\frac{1}{4}$  dB—very close to Audio-source's  $\pm 12$ -dB spec. The amount of EQ in each band is reasonably well indicated by the panel markings, but not perfectly so. (We've yet to see a consumer graphic equalizer whose slider scale accurately reflects the boost or cut realized.) The equalizer can be bypassed, in which case response is within  $\pm 0$ ,  $-1$  dB from 11 Hz to 17.2 kHz and is 3 dB down at 28.5 kHz.

To control hiss from noisy tapes, the AV-One offers a high-cut filter and DNR. The filter is unusual. Rather than having a simple 6- or 12-dB-per-octave slope, its response is 3 dB down at 4.7 kHz and reaches a maximum cut of only  $6\frac{1}{2}$  dB at 12 kHz, above which the curve flattens out and even rises slightly. Measuring DNR response is always problematic when using a swept-tone generator. Suffice it to say that the AV-One's version of this circuit also is unusual in that it seems to insert a sharp horizontal-scan whistle filter (at 15.7 kHz), whose notch deepens as audio level diminishes. This is a logical addition to a processor designed for use primarily on TV audio.

If you have the urge to change the audio program while dubbing a videotape, the AV-One is one of the few accessories that permit you to do so. Certainly it allows more variations on the theme than any other device we've seen, thanks to its three-input audio mixer, which gives you independent control of audio source level (from the source you're taping), audio "line" level (from the AV-One's separate audio line-input jacks), and mike level (from the front-panel microphone input). You

can mix the three signals in any proportion you like or entirely replace the audio program coming from the source by reducing its level to zero and raising the microphone or line slider. Dual nine-segment LED indicators suggest the output level, although there is no way to match their sensitivity to that of your recording deck. Independent controls enable you to fade the audio and video in and out separately or together, as desired.

The AV-One is designed to connect to a tape-monitor loop in your stereo amplifier, which makes its audio circuitry accessible whether or not you're using the video functions. (Tape input and output jacks and a monitor button on the processor substitute for the loop it occupies.) And with the possible exception of the microphone preamp (which has a precariously low overload point), it is an altogether worthy addition. Audio input impedances range from 33 to 43 kilohms, while outputs measure a low 780 ohms—a combination that should assure good interfaces with other equipment. With the fader and mixer controls at maximum (their normal position), gain is close to unity (0 dB) from the line and VCR inputs to the monitor output. The microphone preamp supplies about 50 dB of gain to raise the input to line level. The line input is virtually overload-proof, and the unit will deliver more than adequate output into a standard load before it clips.

With normal control settings, A-weighted noise is 82 dB below our 0.5-volt reference. Switching in the DNR improves this already excellent figure to almost 91 dB, while the high-cut filter alone improves it by 3 dB. Even with the graphic equalizer engaged and at its worst-case settings, the signal-to-noise (S/N) ratio is a satisfactory 68 dB. Midband channel separation is excellent and is maintained quite well at the frequency extremes (72 dB at 100 Hz, 68 dB at 10 kHz). Distortion is somewhat higher than average, especially in the treble region. At a standard 2-volt output level, total harmonic distortion increases from 0.14 percent at 1 kHz to 0.75 percent at 20 kHz, although it's less than 0.06 percent in the bass. Because 2 volts is close to the clipping point of this unit, DSL remeasured distortion at a 1-volt output level and came up with figures approximate-

Except where otherwise indicated, all measurements were made through the line input with the fader and mixer controls at maximum and with all signal processing bypassed.

**AUDIO OUTPUT AT CLIPPING (1 kHz)** 2.3 volts

#### MAXIMUM AUDIO INPUT LEVEL

line inputs (1-kHz clipping) > 10 volts  
mike input (3% THD at 1 kHz) 4.1 mV

#### AUDIO GAIN

line inputs < 1 1/4 dB  
mike input  $\approx 49$  dB

#### AUDIO S/N RATIO (re 0.5 volt; A-weighted)

all processing bypassed 82 dB  
with DNR 90 3/4 dB  
worst case 68 dB

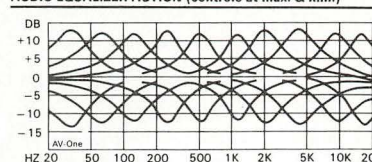
#### HARMONIC DISTORTION (THD; 20 Hz to 20 kHz)

at 2-volt output  $\leq 0.75\%$   
at 1-volt output  $\leq 0.39\%$

#### AUDIO FREQUENCY RESPONSE

$\pm 0$ ,  $-1$  dB, 11 Hz to 17.2 kHz  
 $\pm 0$ ,  $-3$  dB, < 10 Hz to 28.5 kHz

#### AUDIO EQUALIZER ACTION (controls at max. & min.)



**AUDIO HIGH FILTER**  $-6\frac{1}{2}$  dB at 12 kHz

**CHANNEL SEPARATION (at 1 kHz)** 88 dB

#### AUDIO INPUT IMPEDANCE

line inputs  $\geq 33.2k$  ohms  
mike input 12.0k ohms

**AUDIO OUTPUT IMPEDANCE** 780 ohms

#### VIDEO FREQUENCY RESPONSE (bypass)

500 kHz to 2.0 MHz flat  
at 3.0 MHz  $-1/4$  dB  
at 3.58 MHz  $-1/2$  dB  
at 4.2 MHz  $-1/2$  dB



# VIDEO FREQUENCY RESPONSE (DETAIL at max.)

at 500 kHz	+2 1/4 dB
at 1.5 MHz	+3 1/2 dB
at 2.0 MHz	+3 dB
at 3.0 MHz	-3/4 dB
at 3.58 MHz	-3/4 dB
at 4.2 MHz	+1 dB

# VIDEO FREQUENCY RESPONSE (SHARPNESS at max.)

at 500 kHz	+1 1/2 dB
at 1.5 MHz	+7 3/4 dB
at 2.0 MHz	+7 1/2 dB
at 3.0 MHz	-3/4 dB
at 3.58 MHz	flat
at 4.2 MHz	+1 1/2 dB

LUMINANCE LEVEL 10% low

GRAY-SCALE NONLINEARITY (worst case) none

CHROMA LEVEL 2 dB low

CHROMA DIFFERENTIAL GAIN none

CHROMA DIFFERENTIAL PHASE none

CHROMA PHASE ERROR none\*

\*See text.

ly half of those obtained at the standard level. Since the distortion is predominantly second harmonic, it's very unlikely that you'd ever hear it.

Used with discretion, the AV-One's video detail and sharpness controls can do a good job of touching up a picture. When they are bypassed, the AV-One has virtually no effect on the video response of signals fed through it. When switched in, the DETAIL affords a maximum boost of 3 1/2 dB at 1.5 MHz and an almost equivalent effect at 500 kHz and 2 MHz. The SHARPNESS works mainly on the region between 1.5 and 2.0 MHz and has a much greater maximum effect: 7 1/2 to 7 3/4 dB. Its boost at the lowest test frequency (500 kHz) is negligible. Neither control serves to boost frequencies above 3.0 MHz, which is all to the good. With present-day VCRs, there's nothing up there but noise. Except for a slight reduction in

luminance and chrominance levels—by 1 and 2 dB, respectively—the AV-One has no deleterious effect on video performance. Gray-scale linearity and the related chroma differential gain and phase are essentially perfect. Under normal operating conditions there's no change in hue whatsoever, although you may perceive a slight shift as you fade out a video program.

The Audiosource AV-One is such a versatile device, it's a fiddler's delight. At first, you may be intimidated by the sheer number of controls on the front panel, but each is logically marked and does what you would expect. As with any signal processor, you may be tempted to overdo a good thing—at least at first. Once you've become accustomed to its facilities and tempered your enthusiasm with discretion, we think you'll like this new processor as much as we do.

VS

## TEST REPORTS

# Barcus-Berry BBE-2002R Signal Processor

**DIMENSIONS:** 16 1/4 BY 3 INCHES (FRONT), 7 1/4 INCHES DEEP PLUS CLEARANCE FOR CONTROLS AND CONNECTIONS. **PRICE:** \$250. **WARRANTY:** "LIMITED," ONE YEAR PARTS AND LABOR. **MANUFACTURER:** BARCUS-BERRY ELECTRONICS, INC., 5381 PRODUCTION DR., HUNTINGTON BEACH, CALIF. 92649.

Those having long memories will associate the name Barcus-Berry with a novel add-on tweeter called the Audioplate. We haven't heard anything about that product for some time, perhaps because its manufacturer, Barcus-Berry, Inc., now limits itself almost exclusively to the pro audio market. The BBE-2002R is one of a family of signal processors, both consumer and professional, that comprise the first offering from a new subsidiary, called Barcus-Berry Electronics (BBE).

The idea behind the signal processors is to counteract certain types of signal degradation that BBE says are common to virtually all dynamic speaker systems driven by conventional amplifiers. At first, they were all to be servo systems that would detect any deviation of diaphragm motion from that dictated by the signal and then apply a correction signal to bring it back into line. One of the professional units

does work this way, but the company says that this approach, at least in its current implementation, has some limitations. Therefore, most of the processors, including the BBE-2002R, base their action on a model of speaker behavior embedded in a proprietary integrated circuit. Barcus-Berry maintains that most dynamic speakers are similar enough to one another that a single model can serve well for all.

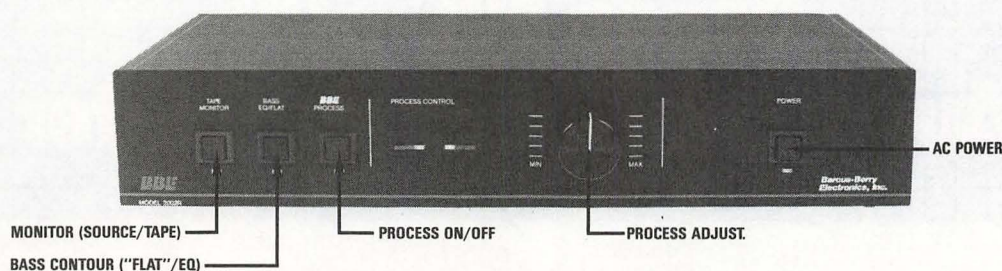
Details of the system are somewhat sketchy, but information supplied by the company indicates that it performs two basic functions. One is simply phase correction, which Diversified Science Laboratories' measurements confirm. The unit introduces a frequency-dependent delay amounting to approximately 1.2 milliseconds at low frequencies, decreasing to 1 millisecond at 575 Hz, 0.8 at 820 Hz, 0.6 at 1.2 kHz, 0.4 at 1.9 kHz, 0.3 at 2.7 kHz, 0.2 at 4.2 kHz, 0.1 at 9.4 kHz, and 0.05 at 20.8 kHz.



The second component of the processing is what BBE calls reactive load compensation, which is said to correct dynamic losses caused by the load reactance of typical speakers. This is achieved by splitting the signal into three bands and comparing their contents. Based on the results and the setting of a front-panel control knob, the processor's circuitry introduces equal-

low 500 Hz.

Testing a device such as this one often presents problems when it comes time to measure noise and distortion, which may vary widely according to control settings or signal conditions. We were therefore surprised to see that the signal-to-noise (S/N) ratio was the same at all positions of the processing control and deteriorated only 1 dB



ization in the high-frequency band (+12 to -5 dB, according to Barcus-Berry). The EQ is constantly varying, depending on the characteristics of the incoming signal. Such dynamic EQ is said to correct the system's final output without imparting the shrillness that similar amounts of conventional equalization might create.

Again, DSL's tests provide confirmation, although the effect extends deeper than BBE's explanation had led us to expect, with some action evident as far down as 200 Hz. The response varies in a complex fashion according to signal level, but at most control settings and levels, its predominant feature is a treble boost commencing somewhere between 500 Hz and 2 kHz. Under some conditions, however, that transition region is depressed a few dB before the rise begins, and there may also be a dip centered on about 300 Hz. The setting of the control appears to affect the character as well as the aggressiveness of the processing.

Barcus-Berry recommends adjusting the processing control by ear, but the manual includes instructions for setting it by a pair of LED indicators on the front panel, as well. The other important control—apart from the bypass switch (which routes the signal entirely around the processor's electronics) and a replacement tape monitor button (for installations in which the 2002R takes up a tape loop)—is a bass EQ switch. Pushing it on adds a fixed boost of approximately 3 dB be-

when the bass EQ was turned on. Distortion was another story, however, and the lab ultimately gave up trying to measure it in our usual manner, as a function of frequency: Any change in the process control setting or the input signal altered the results in ways that defied simple characterization. Maximum output level was similarly difficult to pin down. The processor doesn't really clip, but it does generate a lot of distortion when pushed too hard. Going by the point at which total harmonic distortion (THD) reaches 3 percent, the overload point is 1.95 volts or more, depending on the position of the processing control, which should be more than adequate. Tape-loop installation may, however, lead to slight overload with certain high-output CD players whose peak outputs may exceed 2 volts.

There is only so much you can learn from laboratory analysis of a product such as this one. It's the ear that finally tells the tale. Our first impression when we hooked up the BBE-2002R in our listening room was of increased detail, particularly on voices; the second was of greater brightness. And though it is possible to make the sound rather tinny and brittle by advancing the processing control too far, we would categorize this as abuse. When used in a reasonable fashion, the 2002R seems to live up to its maker's claim of providing greater clarity without accompanying harshness. How much of an advantage it has over conventional equalization in

#### MAXIMUM OUTPUT LEVEL (3% THD+N at 1 kHz)

	≥ 1.95 volts
<b>S/N RATIO (re 0.5 volt; A-weighted)</b>	
without bass EQ	79 dB
with bass EQ	78 dB
<b>FREQUENCY RESPONSE</b>	
	see text
<b>INPUT IMPEDANCE</b>	
	41k ohms
<b>OUTPUT IMPEDANCE</b>	
	39 ohms

#### ABOUT THE dBW

We currently are expressing power in terms of dBW—meaning power in dB with a reference (0 dBW) of 1 watt. The conversion table will enable you to use the advantages of dBW in comparing these products to others for which you have no dBW figures.

WATTS	dBW	WATTS	dBW
1.0	0	32	15
1.25	1	40	16
1.6	2	50	17
2.0	3	63	18
2.5	4	80	19
3.2	5	100	20
4.0	6	125	21
5.0	7	160	22
6.3	8	200	23
8.0	9	250	24
10.0	10	320	25
12.5	11	400	26
16.0	12	500	27
20.0	13	630	28
25.0	14	800	29



this regard is hard to say. We found that we could mimic some of its effect by turning up the treble control on our preamp, although voices did not gain as much and the sound got a little edgier when we applied a lot of boost to the signal.

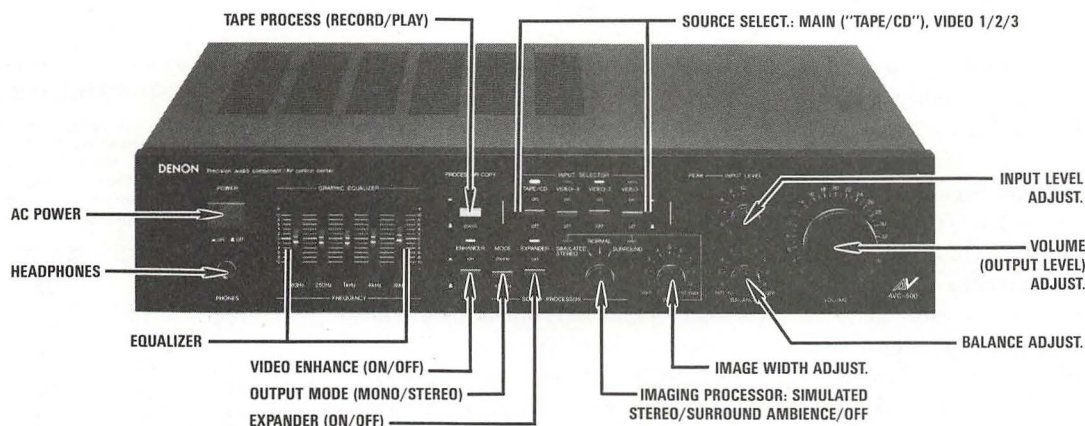
The BBE-2002R is an interesting device. And if you like what it does, you can make recordings through it for playback in your car or portable. In fact, Barcus-Berry is selling its professional models to recording studios, and a number of records have been

made with BBE processing. (The company says that the 2002R detects when a program has been preprocessed and keeps out of the way, so that you don't wind up with EQ on top of EQ.) BBE processing is worth a listen: Try it and see if you like it.

VS

## TEST REPORTS

# Denon AVC-500 Audio-Video Control Center



**DIMENSIONS:** 17 $\frac{1}{4}$ " BY 3 $\frac{3}{4}$ " INCHES (FRONT), 10 INCHES DEEP PLUS CLEARANCE FOR CONTROLS AND CONNECTIONS. **AC CONVENIENCE OUTLETS:** TWO UNSWITCHED (250 WATTS MAX.). **PRICE:** \$375. **WARRANTY:** "LIMITED," THREE YEARS PARTS AND LABOR. **MANUFACTURER:** NIPPON COLUMBIA COMPANY, LTD., JAPAN; **U.S. DISTRIBUTOR:** DENON AMERICA, INC., 27 LAW DR., FAIRFIELD, N.J. 07006.

As you add program sources to your video system, you're faced with the problem of switching among them and, perhaps, dubbing from one to the next. Although many modern monitor/receivers provide multiple direct-video inputs and some furnish video outputs for recording, there's still reason to consider a product like Denon's AVC-500 Audio-Video Control Center.

In addition to source-selection and dubbing facilities—including provisions for replacing the soundtrack of the program being duplicated with a different audio program—the AVC-500 boasts a rather complete range of audio controls, including a five-band graphic equalizer, a peak expander, a stereo simulator, and a surround-sound decoder. Its built-in stereo power amplifier, rated at 25 watts (14 dBW) per channel, can be used to drive either front or back speakers. There's even a video enhancer that can be used to

snap up picture detail when either viewing or copying.

The control center has a bank of mutually exclusive pushbuttons for switching among as many as three direct audio-video program sources. A fourth pushbutton (marked "Tape/CD" and not interlocked with the others in the bank) enables you to record independent audio and video sources on the same videotape. With the Tape/CD key in the normal released position, audio and video stem from the same source; when the key is pressed, the video you are watching (and recording) is determined by the settings of the other three switches, while the audio is taken from the source connected to the Tape/CD line-input jacks on the rear panel. This makes it possible for you to listen to and record simulcasts (if you've connected an FM tuner to the Tape/CD inputs) or to replace the soundtrack of a home video with music from a CD player, tape deck, or other



source.

There are two sets of audio-video recording outputs (Video 1 and 2), a separate video monitor output, stereo and mono line outputs, a tape output (for recording on a deck you may have connected to the Tape/CD inputs), and left and right speaker outputs. With this arrangement, you can dub between Video 1 and 2 in either direction or record on both simultaneously from the Video 3 source. In all cases, the monitor displays the program you've selected to copy. Pressing ENHANCER modifies the video frequency response to both the monitor and video outputs. The setting of PROCESSOR COPY designates whether the audio program being recorded on any tape deck or VCR connected to the unit is passed through the audio signal processors.

A back-panel slide switch determines whether the audio program passes through the surround-sound processor on its way to the line outputs. If the AVC-500's power amp is used to drive the rear speakers (the normal arrangement), the switch is set to send unmodified audio to the external stereo amplifier driving the front pair. If the AVC-500's internal amp is used to drive the front speakers, the switch is set to route signals through the surround-sound circuits before delivering them to the line outputs, from which they can be fed to an external amplifier for the back speakers.

Pressing MODE parallels left and right channels to ensure that sound emerges from both front speakers when a mono source is connected to either the left or right input jack. Normally the switch is kept in the released position to permit stereo reproduction either from a true stereo source or from a mono source via the stereo simulation circuitry.

A three-position rotary switch enables you to choose regular stereo (or mono) reproduction, simulated stereo from a mono source, or surround sound from a stereo source. Denon does not claim that the surround-sound circuitry conforms to the Dolby Stereo standard for encoded movie soundtracks. Rather, the effect is "created electronically by using phase-differencing coloration elements." According to Diversified Science Laboratories' investigation, both the synthetic-stereo and surround-sound effects are

created by comb filters, although not the same ones. In each case, the degree of enhancement is determined by the setting of the "width" control.

The AVC-500's five-band graphic equalizer is controlled by a series of sliders on the left of the control panel. The equalizer sections are spaced at two-octave intervals from 63 Hz to 16 kHz. DSL reports that their center frequencies are very accurately marked and that the maximum boost or cut available is very close to 10 dB in every case. The linearity of the sliders is somewhat worse than average, although we have yet to test a graphic equalizer that has a truly uniform control range. About half the total range is concentrated between the first and second markings above and below the center detent, with most of the rest occurring between the third and fourth. This makes setting the sliders a bit touchy.

The control center's audio expansion circuit is engaged by pressing EXPANDER. An input level control (separate from the master volume and balance knobs) is used to prevent input overload. Normally, it is set to its maximum and turned down only if the peak LED lights up, indicating an overload. The lab found that the LED did illuminate at the point of overload, but only when the expander was on. With the expander off and the input level control all the way up, it was possible to clip the input without triggering the peak LED, but since this required an input of almost 3.7 volts, it's not likely to be a problem.

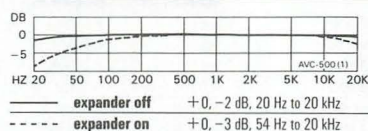
DSL's tests show the expander to be more of a "peak unlimiter" than a classic "linear" expander. With the input level at maximum, the expander had essentially no effect on signals of less than approximately 35 millivolts. The expansion factor gradually increases with rising signal level, reaching 1.2:1 at an input of 125 millivolts. The maximum expansion ratio (1.4:1) occurs at about 200 millivolts.

Strangely, the AVC-500's amplifier power specification is not based on the "standard" 8-ohm load. It is rated for use with speakers whose impedances are between 6 and 16 ohms and is said to deliver 25 watts (14 dBW) per channel into 6 ohms. Since DSL found the clipping level into both 4- and 8-ohm loads to be 28 watts (14½ dBW), we de-

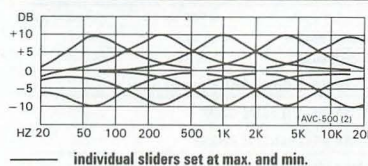
<b>RATED POWER</b>	14 dBW (25 watts)/channel
<b>OUTPUT AT CLIPPING (at 1 kHz; both channels driven)</b>	
8-ohm load	14 1/2 dBW (28 watts)/channel
4-ohm load	14 1/2 dBW (28 watts)/channel
<b>DYNAMIC POWER (at 1 kHz)</b>	
8-ohm load	15 1/2 dBW
4-ohm load	16 1/4 dBW
2-ohm load	15 dBW
<b>DYNAMIC HEADROOM</b>	see text

<b>HARMONIC DISTORTION (THD; 20 Hz to 20 kHz)</b>	
at 14 dBW (25 watts)	≤ 0.55%
at 0 dBW (1 watt)	≤ 0.12%

#### AUDIO FREQUENCY RESPONSE



#### AUDIO EQUALIZER ADJUSTMENT RANGE





AUDIO S/N RATIO (re 0 dBW; A-weighted)		
best case (no processing)	86 1/4 dB	
worst case (surround at max.)	69 dB	
AUDIO SENSITIVITY (re 0 dBW)		
	33 mV	
AUDIO INPUT OVERLOAD (1-kHz clipping)		
input level at max.	3.66 volts	
input level at min.	> 10 volts	
AUDIO INPUT IMPEDANCE		
	46k ohms	
AUDIO OUTPUT IMPEDANCE (to tape)		
	650 ohms	
DAMPING FACTOR (at 50 Hz; re 8 ohms)		
	50	
CHANNEL SEPARATION (at 1 kHz)		
	41 1/4 dB	
VIDEO FREQUENCY RESPONSE		
	enhancer off	enhancer on
at 500 kHz	flat	+1 1/2 dB
at 1.5 MHz	flat	+4 dB
at 2.0 MHz	flat	+3 3/4 dB
at 3.0 MHz	- 1/2 dB	-1 1/2 dB
at 3.58 MHz	- 1/2 dB	+ 1/2 dB
at 4.2 MHz	- 1/2 dB	+1 1/4 dB
LUMINANCE LEVEL		
	enhancer off	enhancer on
to monitor output	3% high	6% high
to Video 2 output	12% low	standard
GRAY-SCALE NONLINEARITY (worst case)		
	none	
CHROMA DIFFERENTIAL GAIN		
	none	
CHROMA DIFFERENTIAL PHASE		
	±0°	
CHROMA LEVEL		
	≤ + 1/4 dB	
CHROMA PHASE ERROR		
	0°	

cided to use the 25-watt rating as our reference, even though at 8 ohms this ran the amplifier closer to the voltage limits of its power supply than would be the case with a 6-ohm load. Under these conditions, total harmonic distortion (THD) was less than or equal to 0.11 percent from 40 Hz to 10 kHz, rising to 0.55 percent at 20 Hz and 0.20 percent at 20 kHz. The predominant harmonics were the second, third, and fifth. At 0 dBW (1 watt), distortion was 0.12 percent or less across the entire band.

Without a power rating into a standard load impedance, it is impossible to assess dynamic headroom, but dynamic power can always be measured. For the AVC-500, it ranges from a low of 15 dBW (32 watts) into 2 ohms to a maximum of 16 1/4 dBW (42 watts) into 4 ohms. With 8-ohm loads, 15 1/2 dBW (35 watts) is available on musical transients. The damping factor is adequately high at low frequencies and is fairly well maintained even out to 20 kHz, where it is the equivalent of 20 referenced to an 8-ohm load.

Input sensitivity, input and output impedances, and audio recording output level should present no problems with typical VCRs and cassette decks. The AVC-500's signal-to-noise (S/N) ratio depends upon how much audio processing you use. It ranges from an excellent 86 1/4 dB with no processing to a still quite respectable 69 dB with the surround-sound mode set at maximum (turning down the width control half-

way improves the noise figure by almost 6 dB).

The video enhancer affects both the monitor and video recording outputs. With it off, there's negligible change in the video signal to the monitor output and, except for a slight reduction in luminance and chrominance levels, virtually no difference at the recording outputs either. Switching the enhancer on raises the luminance and chrominance levels at both outputs (restoring those at the recording output to nominal levels) and boosts video output between 1.5 and 2.0 MHz by approximately 4 dB. Response at 500 kHz and 4.2 MHz is lifted a little more than 1 dB, while that at 3 MHz is reduced 1 1/2 dB.

The Denon AVC-500 is a versatile and unusual component. It combines many elements—video switching and dubbing facilities, a video enhancer, stereo and surround-sound synthesizers, a peak limiter, a graphic equalizer, and a stereo power amplifier—in a single package. Perhaps it's too much to expect it to perform all of its functions as well as dedicated separates might. (A true Dolby Stereo surround-sound decoder produces more realistic effects; an expensive, top-of-the-line video enhancer gives you more control over video response and noise.) But if you want to get your feet wet in audio-video enhancement or to obtain all of these features without busting your bank account, the AVC-500 is a good choice.

VS

## TEST REPORTS

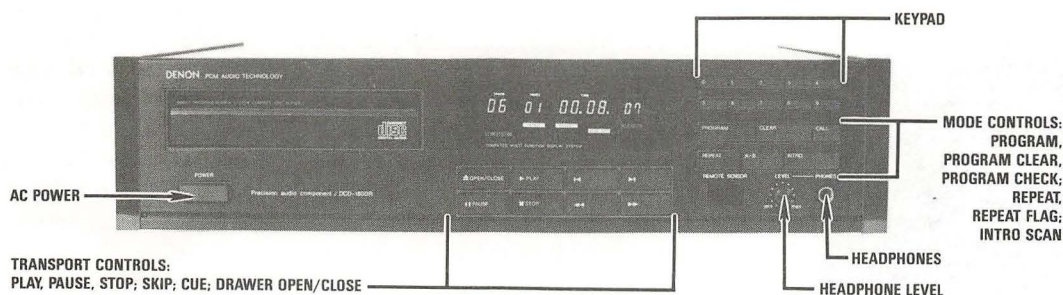
# Denon DCD-1800R Compact Disc Player

**DIMENSIONS:** 18 1/4 BY 4 INCHES (FRONT PANEL), 12 INCHES DEEP PLUS 2 1/2 INCHES MINIMUM CLEARANCE AT BACK FOR HEAT SINK, ETC. **PRICE (INCLUDING RC-1800 WIRELESS REMOTE CONTROL):** \$950. **WARRANTY:** "LIMITED," ONE YEAR PARTS AND LABOR. **MANUFACTURER:** NIPPON COLUMBIA CO., LTD., JAPAN; **U.S. DISTRIBUTOR:** DENON AMERICA, INC., 27 LAW DR., FAIRFIELD, N.J. 07006.

The DCD-1800R might be described as a luxury Compact Disc player—not only because of its unusually comprehensive wireless remote control, but because of the extra care Denon (typically) has taken with its digital-to-analog (D/A) conversion electronics, which are crucial to obtaining the highest possible audio per-

formance. Many other manufacturers claim extra, proprietary quality here, of course, though Denon perhaps commands a little more credibility than most because of its work as a founder of PCM digital recording. Whether past history really is reflected in present facts, we can't tell for sure; but we can attest to the excellence of the final





result.

As Denon explains the design of the DCD-1800R's Super Linear Converter, it gives special handling to the most-significant and second-most-significant bits of the binary PCM code (the two left-hand digits, so to speak), whose nonlinear conversion in more mundane circuitry the company compares to crossover (or notch) distortion in Class B amplifier circuitry. Because of cumulative small errors in the derivation of instantaneous analog voltages from the binary numbers that represent them, discontinuities can appear in the D/A transfer function. It is these "glitches" that Denon seeks to smooth out.

On the convenience front, Denon has provided all the standard features (fast cueing in either direction, for instance—audible if you begin in PLAY, inaudible if you begin in PAUSE) and has added a hefty complement of unusual ones. You can program two ways: by using the SKIP to step to each track you want and then put it into memory or by entering track numbers (as many as 15 of them) directly on the keypad. INTRO SCAN will sample the first ten seconds of each track on the entire disc or, if you've programmed the player, in the sequence. The REPEAT will recycle the entire contents, the complete programmed series, a section of the disc between two "flags" that you insert wherever you want, or (with the end flag set ahead of the beginning one) all of the disc *except* whatever is between the flags.

Two elements in the control scheme struck us as being particularly nice. One is the way most of the functions (CUE, SKIP, INTRO SCAN, and so on) remain available when programmed sequences are played. (There are some oddities, however: You can't cue back into the preceding programmed track, for example.) We also admire Denon's

inclusion on the remote of all controls except the headphone level and the drawer open/close. Since the two missing functions require your presence at or near the player in any event, they don't really belong on the remote, which therefore is as comprehensive as any reasonable user could demand.

When we tried programming the three movements of the middle concerto on a disc containing three works, to test for the player's ability to simulate continuous performance from individual tracks, the DCD-1800R responded superbly. When you're operating the controls—programming the player or recueing the pickup, for instance—it produces a series of beeps and clicks that can be heard quite clearly at six feet or more, quiet as they are, in the silences following or preceding the music. But they aren't produced during playback of the programmed sequence itself and therefore don't distract your attention from the music.

Also handy are an index-number readout on the display panel and (if you have any of the growing number of indexed CDs) a stepper for jumping from one index point to the next. You cannot program by index numbers, however, or go directly to a given number without stepping through the intervening ones, which can be an exceptionally slow process. The display also registers the current track number and elapsed time from its beginning. There are no alternative time modes, but few users will miss them.

Frequency response is up  $\frac{1}{4}$  dB through the bass (say, below 100 Hz), and the curve turns up  $\frac{1}{2}$  dB at 20 kHz in the right channel, with some very slight rippling (less than  $\frac{1}{4}$  dB's worth) above 4 kHz in both. It is thus very flat by normal high fidelity standards, though not exceptionally so for a CD player. The square-wave and impulse photos show approximately average

All data were obtained using the Sony YEDS-7, Technics SH-CD001, Philips 410 055-2, and Philips 410 056-2 test discs.

#### FREQUENCY RESPONSE

left channel	+ $\frac{1}{4}$ , - < $\frac{1}{4}$ dB, 20 Hz to 20 kHz
right channel	+ $\frac{1}{2}$ , - < $\frac{1}{4}$ dB, 20 Hz to 20 kHz

#### DE-EMPHASIS ERROR

left channel	$\pm$ < $\frac{1}{4}$ dB, 1 to 16 kHz
right channel	$\pm$ < $\frac{1}{4}$ dB, 1 to 16 kHz

CHANNEL SEPARATION (at 1 kHz)	84 dB
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CHANNEL BALANCE (at 1 kHz)	$\pm$ < $\frac{1}{4}$ dB
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#### S/N RATIO (re 0 dB; A-weighted)

without de-emphasis	97 dB
with de-emphasis	102 dB

#### HARMONIC DISTORTION (THD + N; 40 Hz to 20 kHz)

at 0 dB	< 0.01%
at -24 dB	< 0.01%

#### IM DISTORTION (70-Hz difference; 300 Hz to 20 kHz)

0 to -30 dB	< 0.01%
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#### LINEARITY (at 1 kHz)

0 to -70 dB	no measurable error
at -80 dB	+ < $\frac{1}{4}$ dB
at -90 dB	+2 dB

#### TRACKING & ERROR-CORRECTION

maximum signal-layer gap	> 900 $\mu$ m
maximum surface obstruction	> 800 $\mu$ m
simulated-fingerprint test	pass

#### MAXIMUM OUTPUT LEVEL

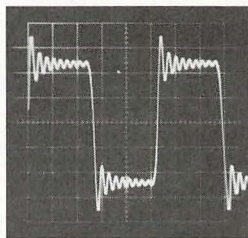
line output (fixed)	2.01 volts
headphone output (adjustable)	4.08 volts

#### OUTPUT IMPEDANCE

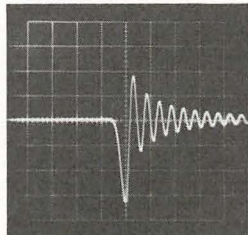
line output	10 ohms
headphone output	110 ohms



SQUARE-WAVE RESPONSE (1 kHz)



IMPULSE RESPONSE



ringing, which, like the small high-frequency response deviations, is caused primarily by the player's steep ultrasonic output-smoothing filter. That the first excursion of the impulse is negative, rather than positive, indicates that the player inverts signal polarity (absolute phase). It is unlikely, however, that either this or the ringing is of any sonic consequence.

The DCD-1800R's Super Linear Converter demonstrated outstanding performance in Diversified Science Laboratories' distortion and linearity measurements. In no case did distortion exceed our 0.01-percent reporting threshold. And linearity was essentially perfect at all but the lowest test level ( $-90$  dB), where the error amounted to a mere 2 dB. We've seldom been able to make comparable statements in past tests of CD players, and we've never before been able to make both about the same model.

The Denon also played all of the

tracking and error-correction test tracks without faltering—an important, if increasingly routine, achievement. Also important, but less commonplace, is satisfactory resistance to shock and vibration. The DCD-1800R is very good in this respect, though severe vertical blows (stronger, in our judgment, than it's ever likely to receive in normal use) did cause mis-tracking.

In listening, two members of our staff, working independently, came to the same conclusion: that the sound of this player may indeed have a perceptible edge over that of many or even most of the models we have encountered recently. If so, however, it is a very subtle advantage, and the evaluation is a subjective one grounded on aural memory, which is notoriously fallible. But whatever degree of excellence individual listeners may wish to assign the player on that basis, its documentable excellence is beyond question. **VS**

## TEST REPORTS

# JVC HR-D 566U HQ VHS Hi-Fi VCR

**DIMENSIONS:** 17 $\frac{1}{4}$  BY 3 $\frac{3}{4}$  INCHES (FRONT PANEL), 14 $\frac{3}{4}$  INCHES DEEP PLUS CLEARANCE FOR CONNECTIONS. **PRICE:** \$899. **WARRANTY:** "LIMITED," ONE YEAR PARTS, 90 DAYS LABOR. **MANUFACTURER:** VICTOR CO. OF JAPAN; **U.S. DISTRIBUTOR:** JVC CO. OF AMERICA, 41 SLATER DR., ELMWOOD PARK, N.J. 07407.

**N**ot to be left behind by the improvements in VCR picture quality afforded by the Super Beta format, JVC, the inventor of VHS, has launched the VHS HQ (High Quality) system of video recording. Unlike Super Beta, which places the luminance carrier at a frequency higher than that used in standard Beta (and thus may not always be compatible with the older system), VHS HQ is claimed to be completely compatible with the VHS standard: Tapes made on an HQ machine should play back on all other VHS machines and vice versa. In fact, given the way the process works, an HQ deck may provide some improvement in picture quality to tapes recorded without it. Just what does HQ do? For a technical explanation, see "What VHS HQ Does." In simple terms, the system is supposed to re-

duce the apparent video noise and increase the apparent contrast of a reproduced image.

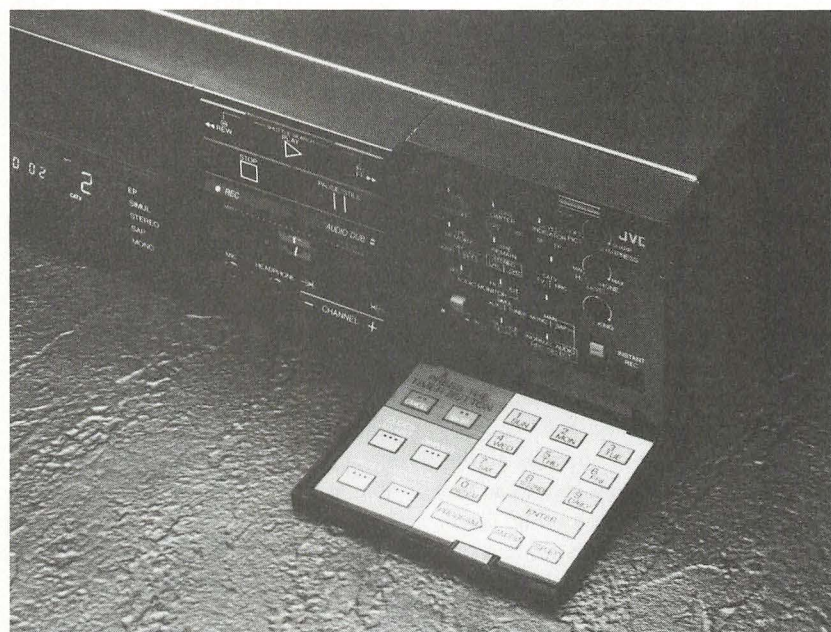
In addition to HQ video circuitry, the HR-D566U includes an MTS (Multi-channel Television Sound) decoder for reception of stereo TV broadcasts and VHS Hi-Fi audio recording for getting them down on tape intact. As with other JVC machines, the unit records only at the two outer VHS speeds (SP and EP), though it will play back tapes made at the intermediate LP speed. Its tuner covers the standard VHF and UHF channels and 113 cable channels. There are two F connectors: one for a VHF/UHF/CATV input, the other for an RF output (with mono audio) on either Channel 3 or Channel 4. JVC provides antenna splitter/mixers to adapt the single RF input to multiple-lead-in systems.



Most of the VCR's secondary controls are easily reached behind a flip-down door at the right of the front panel. There are quite a few knobs and switches, but they add to the model's versatility. For example, you can set it to record video from the composite-video input jack and audio from the line-level stereo inputs, video from the internal TV tuner and audio from the line-input jacks (for taping simulcasts), or both sound and picture from the internal TV tuner. Another switch affects the audio recording mode when the selected source is either the tuner or a simulcast, putting a monophonic

matic frequency control (AFC) and the recorder's internal audio limiter on and off. (The audio limiter always functions on the edge track, but it can be used or not, as desired, for Hi-Fi recording.) And there is a switch that converts the right channel of the recording-level indicators into a "tracking" meter to aid in obtaining the best picture and sound during playback.

Knobs controlling picture sharpness (in playback only) and headphone level also lie behind the flip-down door, as do switches to activate and calibrate the time-remaining counter for T-120 and T-160 cassettes. An "instant re-



blend of the left and right channels on both the edge track and the VHS Hi-Fi tracks, the mono SAP (separate audio program) on the edge track and the main program on the Hi-Fi tracks, or the main soundtrack on the Hi-Fi channels in stereo and on the edge track in mono. Indicator lights warn you when you've chosen the mono mode, while separate indicators show when an MTS transmission is being received and whether it includes an SAP.

There also is a choice of what audio signals you hear on playback: the Hi-Fi channels only, a blend of the Hi-Fi and edge tracks, or the edge tracks only. Another switch chooses how the Hi-Fi audio signals are recorded and fed out in playback: stereo, left channel to both sides, or right channel to both sides. Also behind the door are switches for selecting the antenna input and tape speed and for turning the tuner's auto-

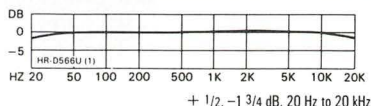
cording" button starts taping immediately from any mode, even if the machine is turned off, as long as the line cord is plugged in. The first press starts a 30-minute timer; additional presses increase the recording time in 30-minute increments up to a maximum of four hours (eight hours if you use the numeric keypad). A timer switch on the subpanel sets up the VCR for unattended recording.

The programming controls are touchpads on the inside surface of the subpanel door. The counter-reset and counter-mode (clock, tape counter, or remaining time) controls are here, too, along with a dimmer switch for the display. The HR-D566U's programmer enables you to record as many as eight events over a two-week period with daily and weekly repeat functions. Clock time and program memory are retained for as long as an hour during

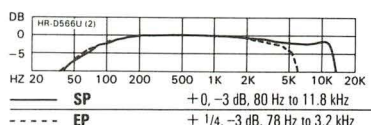
## VCR SECTION

Except where otherwise indicated, the recording data shown here apply to both speeds, SP and EP (SLP); data listed for standard edge-track audio recording were taken with the Dolby B noise reduction engaged. All measurements were made at the direct audio and video outputs, with test signals injected through the direct audio and video inputs. For audio recording, the 0-dB reference input level is the voltage required to produce 3-percent third-harmonic distortion at 315 Hz. The 0-dB reference output level is the output voltage from a 0-dB input.

### VHS HI-FI RECORD/PLAY RESPONSE (-20 dB)



### STANDARD RECORD/PLAY RESPONSE (-20 dB)



### AUDIO S/N RATIO (re 0-dB output; R/P; A-weighted)

	standard	VHS Hi-Fi
SP	48 1/2 dB	83 1/4 dB
EP	46 1/2 dB	82 dB

### INDICATOR CALIBRATION (315 Hz; VHS Hi-Fi)

for 0-dB input	+8 dB
for -10-dB input	-3 dB

### DISTORTION (THD at -10-dB input; 50 Hz to 5 kHz)

	standard	VHS Hi-Fi
SP	≤ 1.36%	≤ 0.69%
EP	≤ 2.25%	≤ 0.69%

### CHANNEL SEPARATION (315 Hz; VHS Hi-Fi)

	58 dB
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### INDICATOR "BALLISTICS"

Response time	23 msec
Decay time	≈ 270 msec
Overshoot	0 dB

### FLUTTER (ANSI weighted peak; R/P; average)

	standard	VHS Hi-Fi
SP	± 0.17%	± < 0.01%
EP	± 0.28%	± < 0.01%

### SENSITIVITY (for 0-dB output; 315 Hz)

	mike	line
VHS Hi-Fi	0.28 mV	230 mV
standard	1.3 mV	1,090 mV

### AUDIO OUTPUT LEVEL (from 0-dB input; 315 Hz)

VHS Hi-Fi	0.97 volt
standard	0.41 volt

### AUDIO INPUT IMPEDANCE (VHS Hi-Fi)

line input	64.5k ohms
mike input	10.2k ohms

### VIDEO RECORD/PLAY RESPONSE

	SP	EP
at 500 kHz	+ 3/4 dB	+ 3/4 dB
at 1.5 MHz	-3 1/2 dB	-5 1/4 dB
at 2.0 MHz	-5 1/2 dB	-9 1/4 dB
at 3.0 MHz	-17 dB	-16 1/4 dB
at 3.58 MHz	*	-10 1/4 dB*
at 4.2 MHz	*	*

### SHARPNESS CONTROL RANGE

at 500 kHz	± 1 3/4 dB
at 1.5 MHz	+ 3 1/2, -7 1/4 dB
at 2.0 MHz	+ 4, -9 3/4 dB
at 3.0 MHz	+ 1 1/4, -3/4 dB
3.58 to 4.2 MHz	no measurable effect

### LUMINANCE LEVEL

SP	4% low
EP	10% low

### GRAY-SCALE NONLINEARITY (worst case)

	≈ 10%
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### CHROMA LEVEL

SP	≈ 1 1/2 dB low
EP	≈ 1 3/4 dB low

### CHROMA DIFFERENTIAL GAIN

	none
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### CHROMA DIFFERENTIAL PHASE

SP	± < 5°
EP	± < 8°

### MEDIAN CHROMA PHASE ERROR

	+ 6°
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\*Unstable or too low to measure

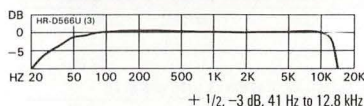




## TV TUNER SECTION

All measurements were taken at the direct audio and video outputs.

### AUDIO FREQUENCY RESPONSE (mono)



### AUDIO S/N RATIO (mono; A-weighted)

best case (no color or luminance)	66 3/4 dB
worst case (crosshatch pattern)	46 1/4 dB

### RESIDUAL HORIZONTAL-SCAN COMPONENT (15.7 kHz)

	-96 dB
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### AUDIO OUTPUT LEVEL (100% modulation)

ALC off	1.67 volts
ALC on	0.49 volt

### AUDIO OUTPUT IMPEDANCE

	970 ohms
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### VIDEO FREQUENCY RESPONSE

at 500 kHz	-1/4 dB
at 1.5 MHz	+ 3/4 dB
at 2.0 MHz	+ 3/4 dB
at 3.0 MHz	-1/4 dB
at 3.58 MHz	-1 1/2 dB
at 4.2 MHz	-8 3/4 dB

### LUMINANCE LEVEL

	4% low
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### GRAY-SCALE NONLINEARITY (worst case)

	≈ 5%
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### CHROMA DIFFERENTIAL GAIN

	≈ 20%
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### CHROMA DIFFERENTIAL PHASE

	≈ ± 4°
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### CHROMA ERROR

	level	phase
red	-3 1/2 dB	+ 2°
magenta	-3 1/2 dB	+ 3°
blue	-3 dB	0°
cyan	-3 1/2 dB	+ 7°
green	-3 1/2 dB	+ 6°
yellow	-3 1/2 dB	+ 7°
median error	-3 1/2 dB	+ 3 1/2°
uncorrectable error	± 1/4 dB	± 3 1/2°

power outages, and the deck loads the tape ten seconds before the appointed start time and commences recording two seconds early so that you don't miss the beginning of a show. You can even choose the recording speed independently for each program, a nicety we've encountered on few other VCRs.

The numerical programming touchpads also can be used to tune a channel directly, even if you're not in the timer mode, or you can scan through the channels via front-panel up/down buttons. As received, the unit is set to run through all VHF and 18 UHF channels, but you can add to or delete from the memory. The VCR's infrared remote control operates all the normal transport modes as well as the scan and direct-access tuning functions. You also can use it to turn the VCR on and off and switch between antenna and VCR.

You can always tell what mode the transport is in by the large illuminated symbols that appear on the left in the display below the tape slot. There are separate symbols for playback, pause, recording, fast forward, and rewind. Submodes are indicated by a combination of symbols. For example, when in recording-pause, the recording symbol (a circle) is combined with the pause symbol (two vertical lines). Shuttle search (at seven times playing speed in either direction) is indicated by the play symbol and the fast-forward or reverse symbol. Audio-only dubbing (available for the edge track only) is represented by a split circle. All in all, it's a very clever display.

Diversified Science Laboratories reports that the HR-D566U's tuner is one of the finest it has tested—especially with regard to video frequency response, which is virtually flat to the color-burst frequency (3.58 MHz) and

less than 9 dB down at the top of the NTSC (broadcast video) band (4.2 MHz). With a superior monitor, horizontal resolution should be just about as good as the NTSC system is capable of providing. The tuner's luminance level is very close to the mark, and gray-scale linearity is virtually perfect. Chroma differential phase is admirably low, and the reported chroma differential gain occurs only at the brightest luminance step, so it is not likely that you'll notice it. This means that neither hue nor color saturation will be affected by changes in scene brightness. Chroma level is low (as usual), but it is almost perfectly uniform across the spectrum and therefore easily correctable at the monitor. Phase (hue) accuracy is very good, too, with a median error of just 3 1/2 degrees and an equivalent uncorrectable spread.

The tuner's audio frequency response is about average. Apparently JVC uses a sharp filter to remove the horizontal-scan component, for it is exceptionally well suppressed in this model. Signal-to-noise (S/N) ratio also is substantially better than average. The audio limiter affects output level when used, but on or off, there's sufficient signal to fully drive a stereo amp.

Video response through the unit's recorder section is significantly better at SP than at EP. With the sharpness control at its center detent, we'd estimate SP resolution to be somewhat better than 160 lines (typical of good VCRs). In extended-play mode, it would be about 120 to 130 lines based on the same -6-dB criterion. Advancing the sharpness knob produces almost perfect video response to 2 MHz in the SP mode and increases EP resolution to about 160 lines, although this results in a perceptible increase in video noise. In practice, the picture



seems somewhat clearer than these numbers would imply, because of the slight accentuation the HQ system gives to sharp edges. Nonetheless, images recorded at the standard speed are noticeably better defined and less grainy than those recorded at EP.

On the back panel is a video noise reduction switch, which JVC recommends be left on for normal playback and defeated when making copies. (DSL measured the VCR's video per-

formance with the switch turned on and rechecked playback with it off.) Defeating the video noise reduction system produces a slight response improvement between 2 and 3 MHz (especially in EP), but at the expense of increased snow. Luminance and chroma

levels also are a bit more accurate at SP, although the differences between the speeds are here too small to have any significant effect. Gray-scale linearity is very good at both speeds, and there's essentially no chroma differential gain at either. Average chroma phase error is the same at both speeds, and though the chroma differential phase is slightly worse at EP than at SP, the difference is again too small to be seen.

## WHAT VHS HQ DOES

JVC'S VERSION OF THE VHS HQ (HIGH QUALITY) SYSTEM CONCENTRATES ON REDUCING LUMINANCE (BLACK-AND-WHITE) AND CHROMINANCE (COLOR) NOISE AND EXPANDING THE "WHITE CLIP" LEVEL, ALL TO PRODUCE SHARPER EDGES ON BLACK-TO-WHITE TRANSITIONS AND TO IMPROVE APPARENT PICTURE CONTRAST. SINCE IT DOESN'T ATTEMPT TO EXTEND VIDEO BANDWIDTH, HQ LEAVES THE LUMINANCE CARRIER FREQUENCY UNCHANGED, AND IT IS SAID THAT TAPES RECORDED ON HQ MACHINES ARE COMPLETELY COMPATIBLE WITH EXISTING VHS RECORDERS.

TO A MAJOR EXTENT, THE VHS HQ SYSTEM CAPITALIZES ON THE PRESENCE OF REDUNDANT INFORMATION IN A NORMAL VIDEO PICTURE. A VIDEO IMAGE ON A MONITOR IS FORMED BY THE SCANNING OF AN ELECTRON BEAM ACROSS THE INNER, PHOSPHOR-COATED SURFACE OF THE PICTURE TUBE'S SCREEN. THE PICTURE IS COMPOSED OF A SERIES OF ALMOST HORIZONTAL SCAN LINES STACKED UP VERTICALLY TO GIVE THE ILLUSION OF A CONTINUOUS IMAGE. IN THE VAST MAJORITY OF SCENES, THE INFORMATION CHANGES VERY LITTLE FROM ONE SCAN LINE TO THE NEXT, AT LEAST WHEN COMPARED POINT BY POINT ALONG ADJACENT LINES. FOR EXAMPLE, IF A GIVEN POINT ON A GIVEN LINE IS BRIGHT, THE POINT DIRECTLY ABOVE IT AND BELOW IT WILL PROBABLY BE BRIGHT, TOO.

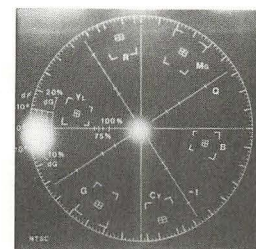
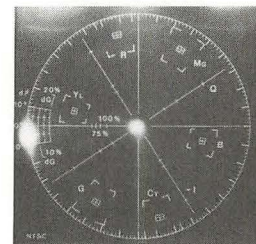
THE HQ SYSTEM USES A CCD (CHARGE-COUPLED DEVICE) TO DELAY VIDEO PLAYBACK INFORMATION BY ONE HORIZONTAL SCAN LINE, WHICH IT ADDS TO THE NEXT INCOMING ONE. TO THE EXTENT THAT THE TWO LINES ARE THE SAME (CORRELATED), THE VIDEO SIGNALS ADD DIRECTLY AND DOUBLE IN LEVEL (INCREASE BY 6 DB). THE NOISE CONTENT OF THE SIGNALS IS RANDOM (UNCORRELATED), SO AFTER ADDITION, THE NOISE WILL INCREASE BY ONLY 3 DB

(THE SQUARE ROOT OF THE SUM OF THE SQUARES OF THE SIGNALS' INSTANTANEOUS AMPLITUDES). THUS, THE ADDING OF ADJACENT SCAN LINES SHOULD PRODUCE A NET IMPROVEMENT OF 3 DB IN LUMINANCE SIGNAL-TO-NOISE (S/N) RATIO. THE ACTUAL PROCESSING IS SOMEWHAT MORE COMPLEX THAN THIS, YIELDING, ACCORDING TO JVC, MORE THAN 3 DB OF EFFECTIVE LUMINANCE NOISE REDUCTION. IN A SIMILAR MANNER, THE VHS HQ CHROMINANCE VERTICAL PROCESSOR CORRELATES THE COLOR INFORMATION LINE BY LINE TO EFFECT A 3-DB IMPROVEMENT IN THE CHROMA S/N RATIO.

THE THIRD BENEFIT CLAIMED FOR HQ IS AN EXTENSION OF THE "WHITE CLIP" LEVEL BY 20 PERCENT OVER THAT OF PREVIOUS VHS RECORDERS. IN A CONVENTIONAL VCR, VIDEO SIGNALS ARE PRE-EMPHASIZED (HIGH FREQUENCIES ARE BOOSTED) BEFORE MODULATING THE LUMINANCE CARRIER, SO THAT COMPENSATORY DE-EMPHASIS AFTER PLAYBACK DEMODULATION WILL REDUCE NOISE INTRODUCED BY THE RECORDING PROCESS. ON A SHARP FULL-BLACK-TO-FULL-WHITE TRANSITION, THE PRE-EMPHASIS CAUSES THE SIGNAL TO OVERSHOOT THE FULL-WHITE LEVEL CORRESPONDING TO 100-PERCENT VIDEO MODULATION.

TO PREVENT OVERMODULATION OF THE VIDEO FM CARRIER, A CLIPPING CIRCUIT TRIMS OFF THE OVERSHOOT. AFTER PLAYBACK DEMODULATION AND DE-EMPHASIS, THE SIGNAL NO LONGER APPEARS AS IT ORIGINALLY DID. THE TRANSITION FROM BLACK TO WHITE STARTS OFF RAPIDLY, BUT BEFORE REACHING FULL WHITE, IT SLOWS DOWN, SLIGHTLY SMEARING THE EDGES OF IMAGES. RAISING THE WHITE-CLIP LEVEL REDUCES THE HIGH-FREQUENCY LOSS, SHARPENING BLACK-TO-WHITE TRANSITIONS AND THEREBY ENHANCING APPARENT CONTRAST AND DETAIL.

EDWARD J. FOSTER



Measured with the audio limiter off, VHS Hi-Fi performance is admirable. Flutter is below our reporting limit at both speeds, as you might expect from a Hi-Fi recording system, and distortion, which is primarily the unobtrusive second harmonic, is acceptably low





(less than 1 percent from 50 Hz to 10 kHz at -10 dB referred to the 3-percent distortion point). Dynamic range—also measured with respect to 3-percent distortion—is 82 dB at the slow speed and 83¼ dB at standard speed, both very good figures. Frequency response is quite flat at both speeds and varies only slightly with changes in recording level. These measurements confirm JVC's claim that the HR-D566U makes an excellent eight-hour audio recorder.

Input and output voltages and impedances are well chosen, although the rather low overload margin on the microphone input suggests that you use care in selecting and placing the mike. Channel separation is not the best we've measured, but it is more than adequate for excellent stereo imaging. The level indicator is calibrated somewhat lower than we've measured on other Hi-Fi VCRs, which is preferable, in our view; as long as you keep the peaks to about 0 dB on the meters, all should be well.

Edge-track recording is in mono, with levels controlled by the audio limiter regardless of the setting of the audio limiter switch. Since third harmonic distortion reached 3 percent before the limiter became fully effective, DSL used that level as its reference. The limiter comes in 2 dB higher and prevents any further increase in distortion. Ten decibels below the reference, distortion is less than 1 percent from 100 Hz to 5 kHz at SP and a little less than twice that at EP. The signal-to-

noise ratio is respectable at both speeds. Flutter is about par for edge-track recording. Overall edge-track frequency response is quite good at SP but is 3 dB down at only about 4.5 kHz at EP.

For a top-of-the-line VCR, the HR-D566U's special video effects are somewhat limited, but we suspect most users will find them adequate (as we did). The unit provides search in both directions at seven times normal speed and a still frame that advances continuously if you hold the pause control down. There is a slight amount of "tearing" and some picture shake with still-frame and a few noise bars and evidence of tearing in the high-speed shuttle modes. But the picture is quite viewable in either case, and we've certainly seen worse. The special effects work equally well at both speeds, but not at all when playing an LP tape.

Audio performance is excellent on the Hi-Fi channels, but noisy and dull with edge-track recording at the EP speed. Color rendition was noticeably blotchier (especially in large solid areas) at EP than at SP, and as mentioned earlier, resolution was notably better at the faster speed, too. For all these reasons, we preferred SP for serious recording. At that speed, the JVC HR-D566U is a stellar performer, and it is only by comparison with that level of quality that we're given cause to complain about the EP reproduction. It's definitely a deck that merits serious consideration, particularly in view of its very competitive price. **VS**

## TEST REPORTS

# Revox B-215 Cassette Deck

**DIMENSIONS:** 17¼" BY 6 INCHES (FRONT), 13¼" INCHES DEEP PLUS CLEARANCE FOR CONNECTIONS. **PRICE:** \$1,390. **WARRANTY:** "LIMITED," TWO YEARS PARTS AND LABOR, EXCEPT FUSES AND BULBS. **MANUFACTURER:** STUDER REVOX GMBH, WEST GERMANY; **U.S. DISTRIBUTOR:** STUDER REVOX AMERICA, INC., 1425 ELM HILL PIKE, NASHVILLE, TENN. 37210.

**R**evox equipment is unique. If you've used any of the company's current electronics—or even if you've just read about them—you'll have some inkling of how this "computer" cassette deck works. If not, you may find it a little awesome at first. Its collection of silver, gray, and

red buttons (or keys, as the manual aptly calls them) makes the B-215 do some things that other decks do in other ways or under other names and some that few decks do at all. But be of good cheer: The exotic quickly becomes familiar, once you dive in, and the results are more than worth an ini-



tial moment of perplexity.

The controls actually are deployed with unusual logic. The normal transport functions are handled by the buttons along the top right, with the level-metering and function readouts on two LCD (liquid-crystal display) panels at the top left. Below the LCDs are the recording controls; below the transport buttons are those for playback functions. The cassette well, in the center, has a pop-off plastic cover to protect it from dust when the deck's not in use. You insert and remove cassettes by hand, without mechanical intervention, so you can flip a cassette over at the end of Side 1 faster than you can with most other unidirectional decks.

Immediately above the well are two large metal buttons. SET LEVEL, on the left, will assess source-signal amplitude for as long as you push it and then will set the recording level accordingly, for a maximum reading of +2 dB on the meters. The operation of FADE IN/OUT is unusual in that it imposes fades, rather than the usual instantaneous action, on the pause control in the recording mode. If you start from the recording-pause mode, the input will fade up to the preset level in about one second; pressing PAUSE again will fade back down and then stop the deck in PAUSE. If you want to halt recording immediately, without a fade-out, you must press STOP rather than PAUSE.

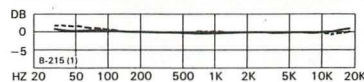
To eliminate the fade-in, you must press the fade button before starting the deck, extinguishing the FADE legend above the meters. However, the B-215 can leave a noticeable "chiff" in the recording if the transport is engaged with the signal at full level. You can

sidestep this problem by using flying starts (pressing both PLAY and RECORD during playback to record over a portion of the music) when you want very tight edits; but in normal operation, the B-215's brisk fade consistently delivers the most pleasing results.

Recording parameters can be set automatically with manual participation by the recordist. The deck reads the keyways in the cassette shell and sets bias and equalization accordingly. But you can override its choices with the tape-type button, which steps through four options: Type 1 (ferric bias, with 120-microsecond EQ); Type 2 (bias for chrome or ferricobalt tapes, with their usual 70-microsecond EQ); Type 2-120 (the same bias, but with 120-microsecond EQ); and Type 4 (metal-tape bias, 70-microsecond EQ). This means that if you have a nonstandard shell, which would create incorrect settings in most decks that match the tape automatically, you can overcome the problem manually. The extra Type 2 option enables you to do what some tape duplicators do: go for the extra high-frequency headroom of the 120-microsecond EQ with chrome or ferricobalt tapes, so that you can have both maximum midrange level (for the widest dynamic range) and clean highs even with demanding signals that would require a lower recording level with 70-microsecond equalization.

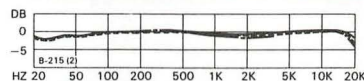
Once you have chosen the basic bias and EQ settings (or once the deck has), the B-215 can fine-tune them and its input sensitivity (Dolby recording calibration) for the specific tape in use and then memorize the results. It has a total of six memories: three for Type 2 tapes, two for Type 1, and one for Type

#### PLAYBACK RESPONSE (BASF test tape; -20 dB DIN)



Left channel + 3/4, -1/2 dB, 315 Hz to 18 kHz  
Right channel + 0, -1/2 dB, 315 Hz to 18 kHz

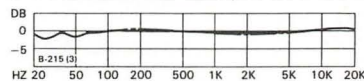
#### RECORD/PLAY RESPONSE, TYPE 2 TAPE (-20 dB)



Left channel (no NR) + 1/2, -3 dB, 20 Hz to 20 kHz

Right channel:  
no NR + 1/2, -2 dB, 20 Hz to 20 kHz  
Dolby B + 0, -3 dB, 20 Hz to 19.5 kHz  
Dolby C + 1/4, -3 dB, 20 Hz to 19 kHz

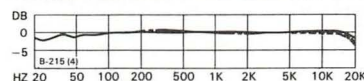
#### RECORD/PLAY RESPONSE, TYPE 4 TAPE (-20 dB)



Left channel (no NR) + 0, -3 dB, 20 Hz to 20 kHz

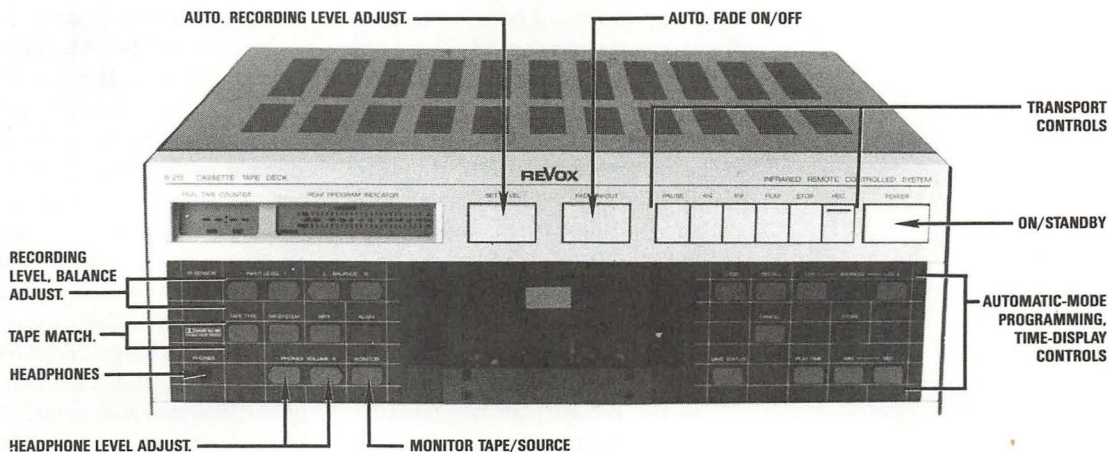
Right channel:  
no NR + 1, -2 dB, 20 Hz to 20 kHz  
Dolby B + 1, -2 dB, 20 Hz to 20 kHz  
Dolby C + 1 1/4, -2 dB, 20 Hz to 20 kHz

#### RECORD/PLAY RESPONSE, TYPE 1 TAPE (-20 dB)



Left channel (no NR) + 1/4, -3 dB, 20 Hz to 20 kHz

Right channel:  
no NR + 1/2, -3 dB, 20 Hz to 20 kHz  
Dolby B + 0, -2 1/2 dB, 20 Hz to 20 kHz  
Dolby C + 3/4, -3 dB, 20 Hz to 19 kHz





<b>MULTIPLEX FILTER (defeatable)</b>			
+ 1/2 dB at 15 kHz; -32 dB at 19 kHz			
<b>S/N RATIO (re DIN 0 dB; R/P; A-weighted)</b>			
	Type 2 tape	Type 4 tape	Type 1 tape
no NR	55 1/2 dB	51 3/4 dB	51 dB
Dolby B	65 1/2 dB	62 1/4 dB	61 1/4 dB
Dolby C	74 1/4 dB	70 3/4 dB	70 1/4 dB
<b>INDICATOR READINGS FOR DIN 0 dB (315 Hz)</b>			
Type 2 tape	+ 3 dB (with 4.0% THD)		
Type 4 tape	+ 2 dB (with 2.0% THD)		
Type 1 tape	+ 2 dB (with 1.1% THD)		
<b>INDICATOR READINGS FOR 3% DISTORTION (315 Hz)</b>			
Type 2 tape	+ 1 dB (for -1 1/4 dB DIN)		
Type 4 tape	+ 4 dB (for +1 3/4 dB DIN)		
Type 1 tape	+ 5 dB (for +2 1/2 dB DIN)		
<b>DISTORTION (THD at -10 dB DIN; 50 Hz to 5 kHz)</b>			
Type 2 tape	≤ 1.3%		
Type 4 tape	≤ 0.70%		
Type 1 tape	≤ 0.61%		
<b>ERASURE (at 100 Hz)</b>			
Type 2 tape	75 1/2 dB		
Type 4 tape	57 1/2 dB		
<b>CHANNEL SEPARATION (at 315 Hz)</b>			
	57 1/2 dB		
<b>INDICATOR "BALLISTICS"</b>			
Response time	4.8 msec		
Decay time	≈ 1,000 msec		
Overshoot	0 dB		
<b>SPEED ACCURACY (105 to 127 VAC)</b>			
	0.5% fast		
<b>FLUTTER (ANSI weighted peak; R/P)</b>			
	± 0.07%		
<b>SENSITIVITY (re DIN 0 dB; 315 Hz)</b>			
	66 mV		
<b>INPUT OVERLOAD (at 1 kHz)</b>			
	2.9 volts		
<b>INPUT IMPEDANCE</b>			
	100k ohms		
<b>OUTPUT IMPEDANCE</b>			
	1,500 ohms		
<b>OUTPUT LEVEL (from DIN 0 dB)</b>			
	0.82 volt		

4 (which are both the scarcest and the most consistent brand-to-brand and therefore the least in need of multiple memories). The memory is selected by pushing ALIGN to step the left display panel to the desired number; the fine-tuning itself is achieved by switching into the recording-pause mode and then pressing ALIGN once more. The B-215 records and evaluates a series of test tones, adjusts itself accordingly, stores the settings in the selected memory, and rewinds to the point at which the process began.

The transport includes an optical sensor, so rewinding proceeds only to the end of the recording tape, not to the end of the leader. Actually, the deck rewinds into the leader, then cues up a short distance into the tape itself (unless you hold the rewind button in until the tape stops, in which case it remains cued into the leader). This is necessary if you're recording over a signal that begins at the very start of the tape, the onset of which otherwise might remain unerased. In general, this automatic cueing scheme is an elegant way of avoiding both the wait while the leader runs through and the rough start that often results from putting signal on the first few inches of tape, though we found its operation rather inconsistent, apparently depending on the transparency of the leader.

Diversified Science Laboratories (DSL) tested the B-215 with BASF Pro II chromium dioxide for the Type 2 formulation, BASF Metal IV for Type 4, and TDK AD-X superpremium ferric for Type 1. DSL followed our standard practice in using ALIGN to tune to each tape with the noise reduction turned off, then measuring response at all noise reduction settings without further fine-tuning. Many decks can be used only this way because engaging the tape-matching controls automatically defeats the noise reduction until the process is finished. Some that can be tuned either with or without noise reduction give better results if they're tuned without, even for noise-reduced recordings. However, the Revox manual (which, like the front panel, is a model of organization, if not of idiomatic English usage) suggests that you should choose your noise reduction mode before alignment.

So the record/play results, fine though they are, might have been

slightly better yet if we had followed the manual rather than standard test practice. It's possible, for example, that the slight midrange bump in the Dolby C curve with Type 1 tape might have been smoothed a bit had the deck been retuned with Dolby C on. But the response curves, as is, are all so broad and flat that they are beyond comparison with those of most other decks. At higher levels (not shown), some slight peaking intrudes into the range above 10 kHz, suggesting relatively low bias settings or overreaction by the built-in Dolby HX Pro headroom-extension circuitry. But again, these curves are excellent by comparison with those of other decks, and the high-level curves remain quite flat to about 8 kHz even with Type 1 tape.

The Type 2 tape exhibits less headroom, not only at high frequencies (to be expected with the 70-microsecond EQ), but also in the midrange, which again suggests underbiasing. The lab's highest recording level in the response tests is at DIN 0 dB (250 nanowebers per meter), which in this case actually is a little above the overload point (represented by 3-percent third harmonic distortion), and some compression is visible throughout the trace. The metering compensates for this, however, by reading 1 dB higher than for the other two tapes and thus encourages you to record 1 dB lower in normal practice. Chrome can stand it: As you can see from the data, its noise level is significantly lower than that of either of the other tapes, so that its total dynamic range actually is greater, despite the slightly restricted headroom.

The signal display has excellent range and resolution—increments of 1 dB (the same as in the recording-level adjustment circuitry) from -6 to +8, giving you a very clear view of any overrecording. The scale extends down to -30 dB, and though the element just below this calibration is always lit (or, in fact, blackened against the reflective background), there actually are two "meter" elements between it and the calibration at -20, giving you an unusually clear picture of signal behavior at low as well as high levels.

The counter (which, except during the tape-matching procedure, dominates the left-hand LCD panel) reads only in minutes and seconds from the head of the tape. The manual says that



you will get the most accurate readings if you start out by cueing to the beginning of the tape and setting the counter for the appropriate tape length (using PLAY TIME to step the display through its cycle: C-46, C-60, C-90, C-120). But it also notes that even if you begin with an unreel tape and misinform the logic about its length, the microprocessor assigned to this function will be able to approximate the time figure within a few seconds after you start playback or recording.

You can store the time "addresses" of two locations on the tape by finding the spot you want and pressing first STORE and then LOC (location) 1 or 2. You can then go to either of these spots by pressing LOC once again—which can be handy in returning to the start of whatever you just recorded, in order to do it over or to double-check its quality. You can also press LOOP, and the deck will repeat the passage between the two markers as many times as you like. If you know the time address of the passage you want (and this system encourages keeping all your labeling records in those terms), you can zero in on it by watching the counter while pressing the appropriate fast-wind button and, as a brake, STOP. Or you can enter the desired elapsed time (which will appear on the display) by tapping or pressing MINUTES and SECONDS, then store it, and, by pressing LOC again, cue automatically to that address.

It all works superbly, though we wish that Revox had included more ex-

planation of how and why, so that the user could understand better everything that is going on. The manual has one brief section on the philosophy behind the use of 120-microsecond EQ with Type 2 tapes, but many users also would like to know more about the tape matching, the automatic leader cueing, the motion/length sensing, and the transport's logic priorities—which, among other things, automatically switch the monitor from SOURCE to TAPE when you begin recording.

Little is said even about the dual-capstan drive, which is responsible for the B-215's excellent flutter figures. All the measurements are excellent, in fact. Input overload does occur at a surprisingly low level (most other decks and electronics clip at something more than 10 volts), but 2.9 volts should be enough to pass even the most ambitious transients from typical source components. Impedances are well chosen to mate with other gear. The headphone output is adjustable in eight level increments.

It almost goes without saying that the B-215 can be controlled remotely, either with the wireless B-201 or as part of an interlinked Revox system, for which there are provisions on the back panel. The options in this respect, which even extend to multiple rooms, make the B-215 potentially part of the world's most sophisticated one-brand music system. But audiophiles will seek it out all by itself for its superb performance and elegant automation. **VS**

## A QUICK GUIDE TO TAPE TYPES

Our tape classifications, Types 1 through 4, are based on the International Electrotechnical Commission measurement standards.

**TYPE 1** (IEC Type I) tapes are ferrics requiring "normal" bias and 120-microsecond playback equalization.

**TYPE 2** (IEC Type II) tapes are intended for use with 70-microsecond playback EQ and higher recording bias. The first formulations of this sort used chromium dioxide; today they also include chrome-compatible coatings such as the ferricobalts and a few metals.

**TYPE 3** (IEC Type III) tapes are dual-layered ferrichromes, implying the 70-microsecond ("chrome") playback EQ. Approaches to their biasing and recording EQ vary somewhat from one deck manufacturer to another, when they are accommodated at all. Formulations of this type are no longer being made.

**TYPE 4** (IEC Type IV) tapes are the metal-particle, or "alloy," tapes, requiring the highest bias of all and retaining the 70-microsecond EQ of Type 2.

## TEST REPORTS

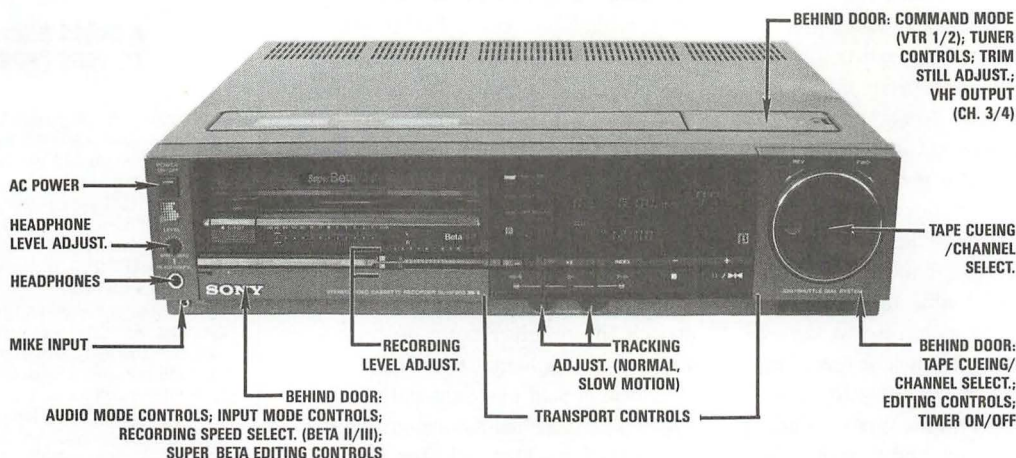
# Sony SL-HF900 Super Beta Hi-Fi VCR

**S**ony invented the consumer videocassette recorder, and though in recent years its Beta format has been losing ground to the rival VHS system, it has remained the leader in technological innovation. Each time there have been improvements to VCR performance, Sony has beaten its large

and numerous VHS competitors to the draw—in special effects, in Hi-Fi recording, and now with the high-resolution Super Beta format. The company's SL-HF900 is the current high-water mark in Beta technology: Super Beta video, Hi-Fi audio, and a host of special features make it an outstanding de-

**DIMENSIONS:** 17 BY 4 1/4 INCHES (FRONT), 14 1/4 INCHES DEEP PLUS CLEARANCE FOR CONTROLS AND CONNECTIONS. **AC CONVENIENCE OUTLETS:** ONE UNSWITCHED (400 WATTS MAX.). **PRICE:** \$1,500. **WARRANTY:** "LIMITED," ONE YEAR PARTS, 90 DAYS LABOR. **MANUFACTURER:** SONY CORP., JAPAN; **U.S. DISTRIBUTOR:** SONY CORP. OF AMERICA, SONY DR., PARK RIDGE, N.J. 07656.





fender of the faith.

In theory (see the accompanying article "Inside Super Beta"), Super Beta should provide better picture detail than conventional Beta recording. Diversified Science Laboratories' tests bear out that expectation—especially at the Beta II speed. And in theory, Beta Hi-Fi audio recording should approach the sound quality of the Compact Disc. And DSL's measurements verify that claim as well. In addition, you get such Sony novelties as a "Jog Dial" and "Shuttle Ring" that serve a triple purpose: variable-speed slow motion (forward or reverse), high-speed channel tuning, and clock/programmer setting.

The SL-HF900's tuner covers standard VHF broadcast channels (2 through 13), UHF Channels 14 through 69, and as many as 125 cable channels. A single F connector serves as the only RF input, so if you have separate VHF and UHF antennas, you will need to combine their outputs with a splitter/mixer before connection to the Sony deck. The SL-HF900 also has RF input and output F connectors for tying in a decoder for pay-TV channels.

The tuner's performance is very good. Video response holds up to the color-burst frequency (3.58 MHz), for a potential resolution of almost 300 lines if the tuner is connected directly to a good monitor. Luminance (brightness) level is almost exactly on target, and though the chroma level (which determines color saturation) is lower than average, it is uniform across the spectrum and can be corrected perfectly. Chroma phase accuracy (hue) is almost perfect, and it, too, is easily corrected. Gray-scale linearity (the accuracy with

which changes in luminance are depicted) is well within acceptable bounds, and chroma differential phase (the degree to which hues vary with changes in brightness) is very low. Although chroma differential gain seems quite high, the error is confined entirely to the brightest picture level and is unlikely to be noticeable on typical program material.

The tuner's audio section is "MTS ready," meaning that it will decode stereo broadcasts if they are available in your area. The mode switch lies beneath a cover on the deck's top surface—an unfortunate location if you intend to stack equipment on the VCR and if you find some channels in your area too weak to receive well in stereo.

If you've elected to record the main channels of a stereo broadcast in Beta Hi-Fi, you can record its Separate Audio Program (if any) on the tape's mono edge track by setting the "normal audio" switch (behind the front-panel flip-down door) to SAP. If you do not record the SAP, the SL-HF900 will put a mono mix of the main audio channels on the edge track. The setting of a monitor switch, also behind the flip-down door, determines what you listen to, both in playback and during recording. You have a choice of the Beta Hi-Fi channels, the edge track, or a mix of the two.

The tuner's audio response is almost ruler flat from 50 Hz to 10 kHz and down 3 dB at 36 Hz and 12.5 kHz. The horizontal-scan whistle is well suppressed, and the signal-to-noise ratio is the best we can recall measuring on a TV tuner—not only under normal conditions but even with the special patterns DSL uses in its tests. Output im-



pedance is somewhat higher than average but should not be of concern in normal hookups, and output level should be adequate.

There are three tuning methods: direct access by channel number (from a ten-key pad on the remote control), scanning through the tuner's memory (via up/down buttons on the front panel or the remote), and spinning through the channels with the Jog Dial. In any event, the channel number that you've tuned in appears in the display, along with the CATV legend if you've set the tuner to the cable mode.

Channels are added or erased from memory by tuning to the desired channel with the Jog Dial and pressing ADD or ERASE under the top lid. The Jog Dial also is used to set the SL-HF900's clock and its 8-event/21-day programmer. Rotating the Jog Dial clockwise advances the time; counterclockwise backs it up. The programmer is both easy to use and versatile, enabling you to record from a channel at the same time every day during the week or at the same time on the same day each week. Both clock and programmer are backed up by an internal rechargeable battery that maintains the VCR's memory through power outages of as long as ten minutes. The SL-HF900 also has a "quick timer" that will automatically shut off a recording that you have started manually at any 30-minute interval, up to five hours in the future.

The SL-HF900 records at Beta II and Beta III speeds in either the Super Beta or conventional Beta mode and will reproduce tapes in the original Beta I format as well. Maximum recording time in the Beta III mode with an L-830 cassette is five hours. Sony advises that Super Beta be turned off if you are making a tape specifically to play on a conventional Beta-format deck (see accompanying article).

A three-position input selector determines whether you are recording audio and video from the built-in tuner, video from the tuner and audio from the line inputs (when recording a simulcast program, for example), or video and audio from the line inputs. A three-position multiplex (MPX) switch—the first we've seen on a VCR—enables you to switch in a stereo-pilot filter when recording from FM. The third position (PCM) is specifically for record-

ing digital audio from a PCM processor.

The recording level in the Beta Hi-Fi mode is adjusted via dual sliders with a center detent that is the recommended setting when recording a TV broadcast. The performance is nearly flawless. Response is flat from below 20 Hz to 10 kHz and less than 3 dB down at 17 kHz at DSL's standard test level (20 dB below the 3-percent distortion level). There is no trace of noise-reduction "tracking" error from -10 dB to -40 dB, and high-frequency overload due to pre-emphasis does not show up until our -10 dB level, which on this deck corresponds to a meter reading of 0 dB.

The meters are peak-responding—with a sufficient decay time for the eye to follow—and free of overshoot. As long as you keep the peak levels to meter zero, distortion will be well under 1 percent even at 10 kHz and less than 1/4 percent to beyond 5 kHz. And you'll have better than 80 dB dynamic range at your disposal, since DSL measured an A-weighted noise level from 92 to 93 dB below the midrange 3-percent distortion point. Channel separation is excellent, wow and flutter are below our reporting limits at both speeds in Beta Hi-Fi, and input and output characteristics are fine for mating with any stereo system.

Even the edge-track audio performance is far better than we've come to expect from the average VCR. Although recording level is set automatically, the "knee" of the limiting curve is at such a high input level that the ALC serves mainly to prevent gross overload. When recording off the air, there's little additional compression of the sound.

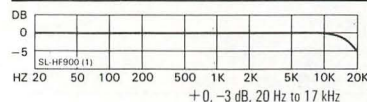
Response at 10 dB below the knee is within 1 dB from 100 Hz to 6.5 kHz at the Beta II speed and down only 3 dB at 6.5 kHz at the slower speed. Flutter is remarkably low, and A-weighted noise is about 48 dB below reference level, which isn't bad at all for VCR edge-track recording. Distortion, measured at the knee, ranges from 1 to 5 percent and is caused as much by the ALC action as by the recording process itself.

DSL measured video-recording performance in the Super Beta mode using "High Grade" tape with the detail switch in its "high" position. (Sony

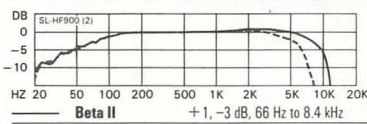
## VCR SECTION

Except where otherwise indicated, the recording data shown here apply to both speeds: Beta II and Beta III. All measurements were made at the direct audio and video outputs, with test signals injected through the direct audio and video inputs. For Beta Hi-Fi, the 0-dB reference input level is the voltage required to produce 3-percent third-harmonic distortion at 315 Hz; for the standard audio recording mode, it is 10 dB above the voltage at which the automatic level control (ALC) produces 3 dB of compression at 315 Hz. The 0-dB reference output level is the output voltage from a 0-dB input. All video measurements were taken in the Super Beta mode.

### BETA HI-FI RECORD/PLAY RESPONSE (-20 dB)



### STANDARD RECORD/PLAY RESPONSE (-20 dB)



### AUDIO S/N RATIO (re 0-dB output; R/P; A-weighted)

	standard	Beta Hi-Fi
Beta II	48 1/2 dB	93 dB
Beta III	47 1/4 dB	92 dB

### INDICATOR CALIBRATION (315 Hz; Beta Hi-Fi)

for 0-dB input	> +5 dB
for -10-dB input	0 dB

### DISTORTION (THD at -10 dB input; 50 Hz to 5 kHz)

	standard	Beta Hi-Fi
Beta II	≤ 4.9%	≤ 0.20%
Beta III	≤ 5.5%	≤ 0.20%

### CHANNEL SEPARATION (315 Hz; Beta Hi-Fi)

	79 dB
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### INDICATOR "BALLISTICS"

Response time	2.8 msec
Decay time	≈ 450 msec
Overshoot	0 dB

### FLUTTER (ANSI weighted peak; R/P; average)

	standard	Beta Hi-Fi
Beta II	± 0.09%	± < 0.01%
Beta III	± 0.13%	± < 0.01%

### SENSITIVITY (for 0-dB output; 315 Hz)

	mike	line
Beta Hi-Fi	see text	2,040 mV*
standard	0.07 mV	3,400 mV

### AUDIO OUTPUT LEVEL (from 0-dB input; 315 Hz)

Beta Hi-Fi	2.0 volts
standard	0.49 volt

### AUDIO INPUT IMPEDANCE (Beta Hi-Fi)

line input	52k ohms
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### VIDEO RECORD/PLAY RESPONSE

	Beta II	Beta III
at 500 kHz	+ 1/4 dB	+ 1/4 dB
at 1.5 MHz	-1 dB	-2 1/4 dB
at 2.0 MHz	-4 dB	-8 1/2 dB
at 3.0 MHz	-17 1/2 dB	-23 1/2 dB
at 3.58 MHz	-27 dB	-21 dB
at 4.2 MHz	-15 1/2 dB	-16 1/2 dB

\*With the recording level control at its detent position; sensitivity is 685 mV with the control turned all the way up.



**SHARPNESS CONTROL RANGE**

at 500 kHz	+1, -3/4 dB
at 1.5 MHz	+2 1/4, -7 1/2 dB
at 2.0 MHz	+3 1/4, -11 3/4 dB
at 3.0 MHz	+4 3/4, -7 1/2 dB
3.58 to 4.2 MHz	no measurable effect

LUMINANCE LEVEL 6% low

**GRAY-SCALE NONLINEARITY (worst case)**

Beta II	≈5%
Beta III	≈8%

CHROMA LEVEL ≈4 1/2 dB low

CHROMA DIFFERENTIAL GAIN none

CHROMA DIFFERENTIAL PHASE ≈±5°

MEDIAN CHROMA PHASE ERROR -4°

recommends the "normal" position if you're not using a high-grade tape.) Video response is down only 4 dB at 2 MHz at the standard recording speed (Beta II), the flattest we've measured to date. Even this small loss can be restored by advancing the SHARPNESS, albeit at some increase in video noise. The SHARPNESS has maximum effect in the region between 2 and 3 MHz—just where the response of the deck is fall-

ing off—so it's uncommonly helpful in correcting the losses in the video recording process if you're willing to put up with a little more "snow" in the reproduced picture.

Video response at the slower speed is quite respectable (-8 1/2 dB at 2 MHz), though no match for that at Beta II. And as usual, chroma noise is greater at the slower speed as well. Luminance level is close to the mark at

## I N S I D E S U P E R B E T A

THE BETA FORMAT HAS ALWAYS HAD A THEORETICAL EDGE OVER VHS BECAUSE IT USES A LARGER-DIAMETER HEAD DRUM TO RECORD ON THE TAPE. IN BOTH SYSTEMS, THE DRUM ROTATES AT 1,800 RPM TO SYNCHRONIZE WITH THE VIDEO FRAME RATE OF THE NTSC BROADCAST SYSTEM (30 FRAMES PER SECOND TIMES 60 SECONDS PER MINUTE EQUALS 1,800 RPM). THE LARGER THE DRUM'S DIAMETER, THE LARGER ITS CIRCUMFERENCE AND THEREFORE THE FASTER THE SPEED AT WHICH THE HEADS MOUNTED ON IT SCAN THE TAPE. THIS SO-CALLED "WRITING SPEED" IS EXACTLY ANALOGOUS TO "TAPE SPEED" IN A LINEAR AUDIO RECORDING SYSTEM. THE FASTER THE WRITING SPEED, THE HIGHER THE FREQUENCY THAT CAN BE RECORDED.

IN A CONSUMER VIDEOCASSETTE RECORDER, LUMINANCE (BLACK-AND-WHITE) INFORMATION FREQUENCY-MODULATES A HIGH-FREQUENCY CARRIER. THE CHROMINANCE SIGNAL (THE COLOR INFORMATION) MODULATES A RELATIVELY LOW FREQUENCY CARRIER. AND WHEN HI-FI RECORDING IS USED, THE LEFT AND RIGHT AUDIO CHANNELS MODULATE CARRIERS THAT ARE SANDWICHED IN BETWEEN. TO KEEP THEM ALL APART, CERTAIN COMPROMISES MUST BE MADE. FOR THE MOST PART, THIS COMES DOWN TO LIMITING THE LUMINANCE BANDWIDTH SO THAT THE SIDEBANDS THAT ARE PRODUCED BY THE FM RECORDING TECHNIQUE DO NOT INTERFERE WITH THE CHROMA AND HI-FI AUDIO, AND VICE VERSA.

IN THE REGULAR BETA SYSTEM, THE CHROMA CARRIER IS AT 688 KHZ AND THE LUMINANCE INFORMATION MODULATES A 4.2-MHZ CARRIER FROM 4.8 MHZ (FULL WHITE) TO 3.6 MHZ (THE "BLACKER THAN BLACK" VIDEO SYNC SIGNAL). AS THE CARRIER DEVIATES OVER THIS 1.2-MHZ RANGE, REPRESENTING THE VARIOUS SHADES OF GRAY, IT GENERATES SIDEBANDS THAT EXTEND LOWER AND HIGHER IN FREQUENCY. IT IS, IN FACT, THESE "SIDEBANDS" THAT CONVEY ALL PICTURE DETAIL, AND THE FINER THE DETAIL THAT IS DESIRED, THE FARTHER FROM THE CARRIER (THE LOWER AND HIGHER IN FREQUENCY) THE SIDEBANDS LIE.

A 2-MHZ VIDEO SIGNAL (CORRESPONDING TO

A PICTURE RESOLUTION OF ABOUT 160 LINES) IS CONVEYED BY SIDEBANDS 2 MHZ ABOVE AND BELOW THE CARRIER FREQUENCY, I.E., BY SIDEBANDS AT APPROXIMATELY 2.2 AND 6.2 MHZ; A 3-MHZ SIGNAL (240-LINE RESOLUTION) IS CONVEYED BY SIDEBANDS 3 MHZ ABOVE AND BELOW THE CARRIER, AT 1.2 AND 7.2 MHZ. THE UPPER SIDEBANDS USUALLY ARE NOT RESOLVED BY THE PLAYBACK HEAD, SO THE SYSTEM RELIES MAINLY ON THE LOWER SIDEBAND. BETA HI-FI VCRS WORK ESSENTIALLY THE SAME WAY, EXCEPT THAT THEIR LUMINANCE CARRIER IS SHIFTED UP 400 KHZ (0.4 MHZ) TO MAKE ROOM FOR THE FM AUDIO SIGNALS.

WHEN AN ATTEMPT IS MADE TO RECORD TOO MUCH DETAIL, THE LOWER SIDEBAND INTERFERES WITH THE CHROMINANCE AND HI-FI AUDIO INFORMATION. THAT, IN A NUTSHELL, IS WHY CONSUMER VCRS DO NOT PROVIDE THE FULL HORIZONTAL RESOLUTION OF WHICH THE NTSC SYSTEM IS CAPABLE.

SUPER BETA INCREASES RESOLUTION BY MOVING THE LUMINANCE CARRIER UP 800 KHZ (OR 400 KHZ IN HI-FI DECKS). THE CHROMA AND BETA HI-FI AUDIO CARRIERS STAY THE SAME, AND THE MAXIMUM DEVIATION OF THE LUMINANCE CARRIER REMAINS 1.2 MHZ. (IN SUPER BETA, FULL WHITE CORRESPONDS TO 5.6 MHZ, WHILE THE SYNC TIP LIES AT 4.4 MHZ.) CONSEQUENTLY, THERE IS MORE "ROOM" BETWEEN THE LUMINANCE CARRIER AND THE CHROMA AND BETA HI-FI CARRIERS FOR THE SIDEBANDS THAT CORRESPOND TO PICTURE DETAIL.

OBVIOUSLY, THIS IS A CHANGE IN THE BETA STANDARD, WHICH MAY MEAN THAT A CONVENTIONAL BETA VCR WILL HAVE SOME TROUBLE PLAYING SUPER BETA TAPES, EITHER BECAUSE ITS LUMINANCE DEMODULATOR CANNOT "FIND" AND LOCK ONTO THE HIGHER-FREQUENCY CARRIER OR BECAUSE ITS PLAYBACK HEADS ARE NOT CAPABLE OF RESOLVING THE HIGHER-FREQUENCY INFORMATION. WE DON'T KNOW. IT IS POSSIBLE THAT SOME DECKS WILL HAVE DIFFICULTY AND OTHERS NOT, OR EVEN THAT ALL OF THEM WILL WORK FINE. BUT SUPER BETA VCRS, SUCH AS THE SONY SLHF900, DEFINITELY ARE COMPATIBLE WITH THE STANDARD BETA FORMAT.

EDWARD J. FOSTER



both recording speeds. Although the gray-scale linearity is a tad worse at Beta III than at Beta II, there's nothing to complain about in that regard in either case. Chroma level is lower than standard, but color accuracy can be brought on target with just a slight touch-up in chroma phase and a more substantial one in chroma gain. Chroma differential gain and phase are low enough to be substantially masked by the residual chroma noise.

The SL-HF900 is loaded with special video features. If you press **PLAY** and **REWIND** simultaneously, the tape spools back to the beginning and automatically replays. Pressing **X2** doubles the playback speed—with double-speed sound as well if the audio was recorded in Beta Hi-Fi. Pressing **FAST FORWARD** or **REWIND** during playback gives you a high-speed search (Beta-scan), albeit without sound. Or you can view the picture momentarily (Beta Skipscan) by pressing **FAST FORWARD** or **REWIND** while fast-winding.

The SL-HF900 has a real-time tape counter—calibrated in hours, minutes, and seconds—that automatically resets when a new cassette is inserted or that can be reset manually at any point. Pressing **TAPE RETURN** rewinds (or advances) the tape to the counter-zero point, and if you want to view the tape from that point, pushing **PLAY** after **TAPE RETURN** will fast-wind the tape to counter zero and begin playback.

Each time a new recording is started, the SL-HF900 puts an index mark on the tape, and you can go back and record additional marks at any point in a program—even on a cassette with the safety tab removed—by pressing the index button where you want them placed. Except for those laid down at the start of a recording, index marks also can be erased selectively or in toto.

You can scan a tape for the marks by pressing **INDEX** once and then either of the fast-wind controls. The deck will advance or rewind the tape to the next mark, play back approximately ten seconds of program, and then go to the next mark. When you find the program you want, just press **PLAY**. If you know how many index marks ahead of or behind the desired program the tape is, you can skip to it directly by repeatedly pressing **INDEX** until the appropriate number appears in the display. Then

press the fast-wind button that will get you moving in the right direction.

When a tape is playing, **PAUSE** freezes the current frame. You can then scan forward or back, frame by frame, by rotating the Jog Dial. The faster you twirl the dial, the faster the frames move by. Very neat! The Jog Dial is accessible from either side of a door on the front panel. Opening this door reveals yet another special-effect control, called the Shuttle Ring, around the Jog Dial. This spring-loaded ring can be twisted clockwise or counterclockwise to provide variable-speed playback—in either direction—at from one-fifth normal speed to double speed.

Many of the deck's special features can be operated from its remote control, along with volume adjustment and the standard transport functions. It can even be used to adjust the volume and activate the on-screen displays of certain Sony TVs; if you don't want the VCR remote to control the TV, you can set a switch to prevent it from doing so.

Finally, the SL-HF900 has the most extensive editing features that we can recall seeing. There's a switch that modifies the deck's playback circuitry to produce copies with better definition than is possible with the standard setting, plus video and audio insert buttons behind the Jog Dial door and a nifty way of dovetailing one recording with another. With the SL-HF900 serving as the deck on which you make the copy, you use the **PAUSE** and the Jog Dial to advance the tape to the point at which you want your insertion to end. Then you reset the counter and back the tape up with the Jog Dial or Shuttle Ring to the point at which you wish the insertion to start. When the scene you want to insert begins, you press **PAUSE** and the SL-HF900 commences recording, stopping when it reaches the counter-zero point.

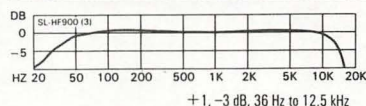
And if you are copying from the SL-HF900 to certain other Sony VCRs, you can preset the system so that, with a push of a button, the desired (and only the desired) part of a tape will be played by the SL-HF900 and recorded on the other deck. With this feature, you can assemble a program in just about any way you like.

The real proof of the pudding is in the performance, which is simply the finest we've seen from a VCR. The SL-

## TV TUNER SECTION

All measurements were taken at the direct audio and video outputs.

### AUDIO FREQUENCY RESPONSE (mono)



+1, -3 dB, 36 Hz to 12.5 kHz

### AUDIO S/N RATIO (mono; A-weighted)

best case (no color or luminance)	53 1/2 dB
worst case (crosshatch pattern)	45 dB

### RESIDUAL HORIZONTAL-SCAN COMPONENT (15.7 kHz)

	-58 dB
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### AUDIO OUTPUT LEVEL (100% modulation)

	0.39 volt
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### AUDIO OUTPUT IMPEDANCE

	3,300 ohms
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### VIDEO FREQUENCY RESPONSE

at 500 kHz	+ 1/4 dB
at 1.5 MHz	+ 3/4 dB
at 2.0 MHz	+ 1/4 dB
at 3.0 MHz	-2 1/4 dB
at 3.58 MHz	-5 dB
at 4.2 MHz	-18 dB

### LUMINANCE LEVEL

	6% high
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### GRAY-SCALE NONLINEARITY (worst case)

	≈ 14%
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### CHROMA DIFFERENTIAL GAIN

	≈ 35%
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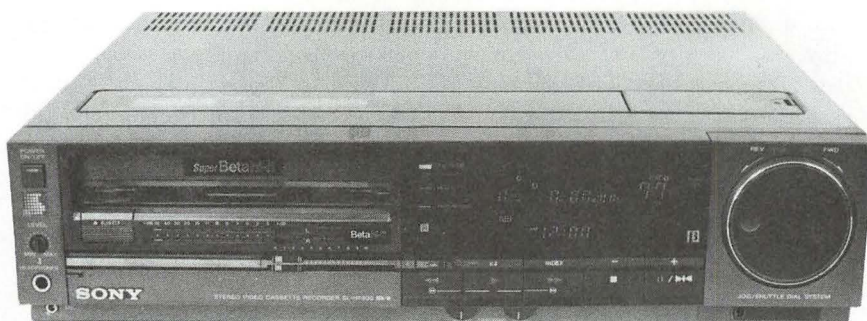
### CHROMA DIFFERENTIAL PHASE

	≈ ±5°
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### CHROMA ERROR

	level	phase
red	-5 1/4 dB	+3°
magenta	-5 1/4 dB	+3°
blue	-5 1/4 dB	+2°
cyan	-5 1/4 dB	+6°
green	-5 1/4 dB	+4°
yellow	-5 1/4 dB	+6°
median error	-5 1/4 dB	+4°
uncorrectable error	none	±2°





HF900's tuner is sensitive, quiet, and produces excellent color. On the one strong stereo TV station we pick up in our fringe area, reception was good and separation was subjectively excellent.

Sony packs a short demo cassette with the unit, recorded at the Beta II speed in Super Beta with Beta Hi-Fi sound, and it's a real zinger. The colors are gorgeous, definition is superb, and the sound is truly high fidelity. And the tapes we recorded ourselves were almost as good.

The SL-HF900's SHARPNESS can be used effectively to snap up detail, and with a high-quality tape, there's less increase in snow than we've seen with

run-of-the-mill VCR sharpness controls. Basic video performance in Beta II is better than in Beta III (as DSL's tests suggest it should be), but even at the slower speed, picture rendition is comparable to that of many other VCRs at standard speed. And at the higher speed, it is noticeably better. The special effects are great at both speeds: Even with freeze frame, there's rarely a noise bar in the viewing area.

The SL-HF900 is a superb deck in every regard, with performance that sets new standards for consumer videocassette recorders. If you're sold on the Beta format, we don't know how you could do better.

**VS**

## TEST REPORTS

# Sony D-7 Portable Compact Disc Player

**DIMENSIONS: 5 BY 1 1/4 BY 5 1/4 INCHES. PRICE: \$299, INCLUDING ACCESSORIES. WARRANTY: "LIMITED," ONE YEAR PARTS, 90 DAYS LABOR. MANUFACTURER: SONY CORP., JAPAN; U.S. DISTRIBUTOR: SONY CORPORATION OF AMERICA, 1 SONY DR., PARK RIDGE, N.J. 07656.**

Sony's second portable Compact Disc player, the D-7, is the first to officially bear the trademarked designation "Discman." Whether the term will catch on the way "Walkman" did remains to be seen. But judging from the popularity of the CD system, and from the D-7's performance, convenience, appearance, and price, Sony should be prepared for the word to become an almost generic term, like "xerox," "kleenex," "q-tip,"—and "walkman." For in a very small space, the D-7 manages to incorporate the sound quality of a typical home CD player, all the standard cueing and scanning features, 16-selection programmable playback, and an unobtru-

sive, easy-to-understand liquid-crystal display (LCD) readout.

The D-7 provides an astonishing degree of control using only seven push-buttons on the front panel. Once the master power switch on the side of the unit is turned on, the large play key also serves as the pause control on alternate pushes. The stop key also turns off the power, which can be reactivated by pressing the play key. The two track-skip keys (Automatic Music Sensor, or AMS, as Sony calls them) also serve as scan controls when the KEY mode switch has been pushed. Two scan speeds are provided: The faster (available when the unit is in pause) mutes the output, whereas the slower



one does not. The other mode control (labeled "PLAY") is used to choose standard playback, repeat playback of a selected segment of a disc, Shuffle Play (in which the tracks on a disc are played in random order), or programmed-memory playback. The enter/remain key enables you to choose the beginning and end points for repeat playback, to enter a track selected with the AMS buttons into memory, or, while the unit is playing, to display the remaining number of tracks and the total remaining time. The LCD otherwise shows the currently playing track and its elapsed time. It also has indications for playback mode, AMS/san modes, and battery condition.

Unlike its predecessor (the model D-5), the D-7 comes supplied with everything one needs for stationary or portable operation, including a rechargeable lead-cell battery pack (giving more than 4½ hours of playback time from a full charge), an AC power adapter/charger, a soft carrying case (with a rubberized exterior for a modicum of additional shock protection), a carrying strap that snaps onto the battery module, and a patch cord to connect the player's fixed-level line output to a component system. Most interesting of the accessories is the player-size battery pack: It snaps directly onto the bottom of the D-7, adding only ½ inch to the player height and approximately doubling its weight (the battery pack weighs 1 pound 3 ounces). Earlier portable-CD battery packs were either larger and heavier snap-ons or equally unwieldy carrying cases with rechargeable cells built in. An alternative battery case for the D-7, the EBP-380, holding eight alkaline AA cells that can power the player for three hours, is available for \$20. Additional BP-200

lead-cell packs also are available for \$45 each. No headset is supplied, but the D-7's jack is of the miniphone variety and will take most headphones directly or through an adapter.

Like the D-5, the D-7 exhibits a slight high-frequency attenuation (both channels are down by ½ dB at 7 kHz and by more than 1 dB at 20 kHz). The rolloff is easily heard on white or pink noise in a matched-level comparison with a player having measurably flatter response but is not usually detectable with music, depending on how much sustained treble energy it contains. Also potentially audible is the unusually large pre-emphasis error, which computer calculations show could produce a total rolloff of more than 2 dB at 20 kHz when playing a pre-emphasized disc. Keep in mind, however, that these deviations are noticeable as such only in direct comparison with a player having flatter response. When used alone, the D-7 sounds just fine. Some might even prefer the high-frequency droop, as it may help tame edgy-sounding recordings.

The rest of the measurements made by Diversified Science Laboratories fall right into line with data for current home players. Tests for output-level linearity, channel separation, distortion, and defect-tracking ability yielded consistently fine figures, or better. At 1.65 volts, the line-output level is a little lower than that of most home players (typically about 2 volts), but the difference should be of no consequence. The noise level is a bit high compared with that of many home units, but still inaudible in use. Also of absolutely no musical significance are the turn-on thump heard through headphones and the fact that the headphone volume control does not fully attenuate

All data were obtained using the Sony YEDS-7, Technics SH-CD001, Philips 410 055-2, and Philips 410 056-2 test discs.

#### FREQUENCY RESPONSE

<b>without de-emphasis</b>	
left channel	+0, -1 3/4 dB, 20 Hz to 20 kHz
right channel	+0, -1 1/2 dB, 20 Hz to 20 kHz
<b>with de-emphasis</b>	
left channel	+0, -3 dB, 20 Hz to 19 kHz
right channel	+0, -2 3/4 dB, 20 Hz to 20 kHz

**CHANNEL SEPARATION (at 1 kHz)** 88 1/2 dB

**CHANNEL BALANCE (at 1 kHz)** ±0 dB

**S/N RATIO (re 0 dB; A-weighted)**

without de-emphasis	91 1/2 dB
with de-emphasis	98 dB

**HARMONIC DISTORTION (THD + N; 40 Hz to 20 kHz)**

at 0 dB	≤0.21%
at -24 dB	≤0.059%

**IM DISTORTION (70-Hz difference; 300 Hz to 20 kHz)**

0 to -30 dB	<0.01%
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**LINEARITY (at 1 kHz)**

0 to -70 dB	no measurable error
at -80 dB	+ 1/2 dB
at -90 dB	+4 1/4 dB

**TRACKING & ERROR-CORRECTION**

maximum signal-layer gap	800 μm
maximum surface obstruction	≥800 μm
simulated-fingerprint test	pass

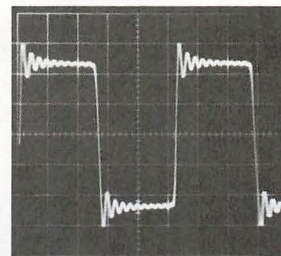
**MAXIMUM OUTPUT LEVEL**

line output	1.62 volts
headphone output	2.70 volts*

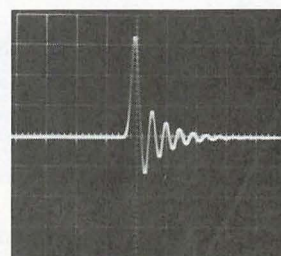
**OUTPUT IMPEDANCE**

line output	440 ohms
headphone output	28 ohms

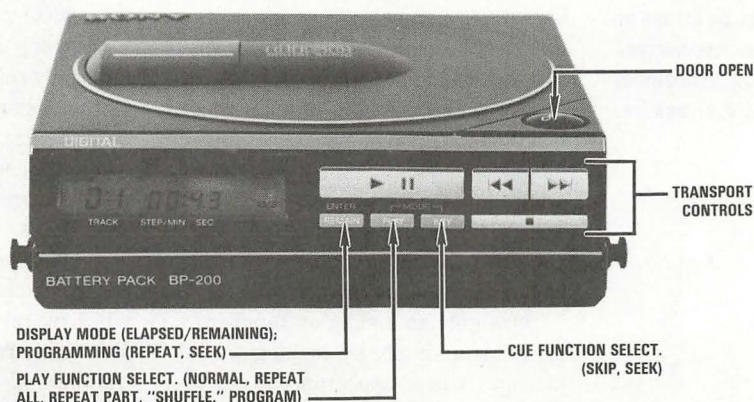
**SQUARE-WAVE RESPONSE (1 kHz)**



#### IMPULSE RESPONSE



\*Into an open circuit. Output is 1.42 volts into a 50-ohm load.





the output when it is turned all the way down.

The characteristic that makes the D-7 such an intriguing product—its portability—is one not amenable to lab testing. So we suited up for the cold New York winter and took the Discman for a walk. The D-7 proved far more comfortable to carry than any of the other portable CD players we've examined, mainly because it is the smallest and lightest of them all, especially when configured for portable use. But even though it is relatively lightweight, the D-7 still feels massive. Slung over the shoulder, it forms a distinctly bulky presence, being larger and heavier than most Walkman-type portable cassette players. On the other hand, the D-7's sound quality is obviously better than that of the best portable cassette units. At the very least, there is no wow and flutter no matter how much the Discman is jostled or vibrated when walking.

Naturally, there are limits to how much abuse the D-7 can withstand. We found that rapid descents via stairways into the New York subway system often would momentarily jolt the

laser off track. When this happens, the sound mutes for a fraction of a second and usually picks up very close to where it left off. Subway rides, despite relatively high vibration levels, disturbed playback not at all. This bodes well for using the D-7 in a car, though digitally accompanied jogging is out of the question. We also found that the player is far less susceptible to mistracking if strapped on beneath a coat or a jacket. The extra layer of clothing evidently damps excessive player vibration and prevents the package from swinging away from the body and then hitting the hip, which seemed to cause most of the mistracking we heard in portable use.

Wearing the D-7 does pose a few difficulties attributable to the control layout. Specifically, when the Discman is worn over the right shoulder in the position that permits reading of the front-panel labels, one has to reach back around the player to get at the volume thumbwheel. And the headphone cord emerges from near the volume control, possibly leading to encumbering entanglements. When the unit is worn over the left shoulder,

these problems disappear. For large or gloved fingers, the thumbwheel may not project far enough (particularly when the carrying case is used), and it is located too close to one of the strap hitching posts for easy manipulation. Finally, the other player controls are not accessible without the lid of the carrying case falling all the way open, a condition easily remedied with a rubber band. All this means is that you should "try on" a D-7 before you buy it to make sure that you'll be comfortable with the way the controls are arranged.

But these matters need not concern you if you intend only to take advantage of the unit's small size and easy transportability. Sitting on a tabletop, attached to a component stereo system, the Sony Discman can hold its own in operating convenience and sound quality against all but the full-bore ultraprogrammable, remote-controlled home CD players. With its battery pack removed, the already diminutive D-7 becomes an even more elegant, compact, and appealing demonstration of digital audio's sonic superiority.

VS

#### TEST REPORTS

## Tandberg TCD-3014A Cassette Deck

**DIMENSIONS:** 17 1/4" BY 6 1/2" INCHES (FRONT), 13 3/4" INCHES DEEP PLUS CLEARANCE FOR CONTROLS AND CONNECTIONS. **PRICE:** \$1,595. **WARRANTY:** "LIMITED," 90 DAYS PARTS AND LABOR, AUTOMATICALLY EXTENDED TO THREE YEARS ON RETURN OF WARRANTY REGISTRATION CARD. **MANUFACTURER:** TANDBERG A/S, NORWAY; **U.S. DISTRIBUTOR:** TANDBERG OF AMERICA, INC., P.O. BOX 58, ARMONK, N.Y. 10504.

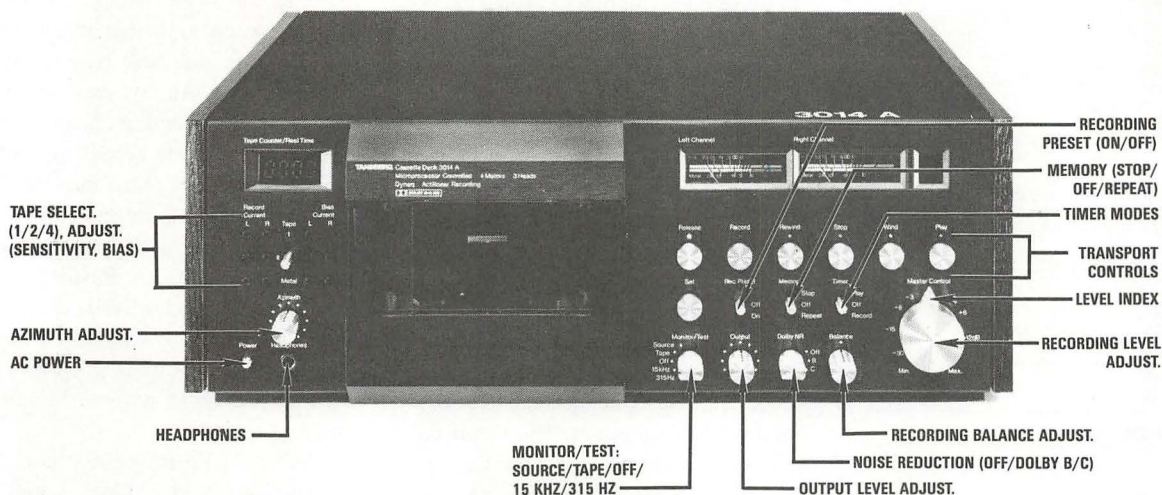
**T**andberg has worked very hard in recent years to shed its image as strictly a tape-deck manufacturer, and if the acceptance of its line of high-performance electronics is any guide, it has succeeded handsomely. But this should not be permitted to obscure the fact that the company does make superb and remarkably individualistic tape recorders. An obvious example is its only cassette deck, the TCD-3014A, which works not only very well but also rather differently from any other model on the market.

One gets an inkling of Tandberg's iconoclasm simply by looking at the machine, whose appearance is far removed from the Japanese style now

taken as the norm. The level indicators are analog meters rather than LED strings, and the cassette well juts forward from the front panel, protected from dust by a removable plastic cover. Everything about the TCD-3014A is unusually solid, from the chassis itself to the cast and machined closed-loop dual-capstan tape-transport mechanism. Indeed, that one critical part weighs more than some complete cassette decks.

To the eye, the TCD-3014A is identical to its predecessor, the TCD-3014, which we reviewed in VIDEO & SOUND, VOL. 2. Internally, however, there are a number of refinements, including more sophisticated recording and out-





put circuits and better parts (such as polystyrene capacitors and close-tolerance resistors) in key sections of the signal path. And Tandberg has made the wireless remote control standard instead of optional, at a savings of about \$100 to the buyer.

On the surface, operation of the TCD-3014A is fairly straightforward; the basic recording and playback functions will be, for the most part, familiar to anyone who has used any kind of high fidelity cassette deck. The one conspicuous oddity is the "recording preset" switch, which must be on before you can start recording. Then all you have to do is press RECORD. You can even do flying starts (going directly from playback to recording or vice versa). Recording levels are set by means of a master fader and a balance control—our favorite scheme. The fader has an adjustable detent whose position is set by means of a plastic tab protruding from behind the knob. Thus, you can set the recording level and then fade in and out from it easily and reliably without losing the ability to push beyond the initial setting when circumstances warrant. This very flexible and intuitive system is one of the deck's nicest touches.

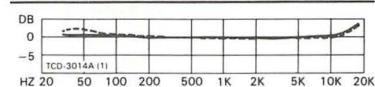
The TCD-3014A includes Dolby B and C noise reduction. (There is a multiplex-filter switch, by the way, on the back panel.) It also provides manual adjustments for recording azimuth, sensitivity, and bias, abetted by 315-Hz and 15-kHz test-tone oscillators and the recording-level meters. These enable you to set the deck up for low distortion and flat response with just about any good tape. Recording and play-

back equalization are selected automatically, according to the cassette-shell keyways, although you can force the playback EQ to 70 microseconds (for old chrome or metal tapes that lack the appropriate shell notches) with a back-panel switch. And like other recent Tandberg tape decks, the TCD-3014A incorporates the company's proprietary Dyneq dynamic equalization circuit, which cuts back the recording pre-emphasis at high levels to forestall tape saturation and its attendant distortion and treble losses.

Below this surface layer of operation lurks a second, more complex and sophisticated level mediated by an 8-bit microprocessor. Many of its most interesting features require you to press two of the transport buttons at once, and since these functions are not marked in any way on the front panel, the potential for confusion and mistakes is relatively high. Fortunately, the manual is much improved over the one initially supplied with the TCD-3014, making the deck easier to learn.

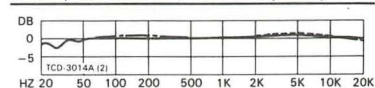
In addition to the usual timer and repeat functions, the TCD-3014A enables you to set up a repeat between any two points on a tape and to choose any particular program on a tape for playback simply by punching in the number of selections that should be skipped. The latter feature is aided by the tape counter, which indicates how many selections you have entered to be skipped. The counter has two other modes: as a standard turns counter and as a real-time counter. The elapsed-time display is one of the best we've encountered. When activated, it automatically calibrates itself to the

#### PLAYBACK RESPONSE (BASF test tape; -20 dB DIN)



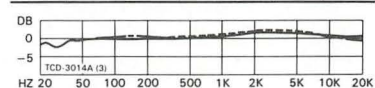
Left channel +3 1/2, -1/2 dB, 315 Hz to 18 kHz  
Right channel +3, -3/4 dB, 315 Hz to 18 kHz

#### RECORD/PLAY RESPONSE, TYPE 2 TAPE (-20 dB)



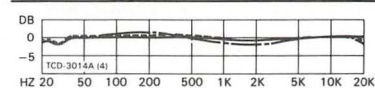
Left channel (no NR) +1 1/2, -3 dB, 20 Hz to 20 kHz  
Right channel:  
no NR +1, -3 dB, 20 Hz to 20 kHz  
Dolby B +1 1/2, -3 dB, 20 Hz to 20 kHz  
Dolby C +1 1/2, -3 dB, 20 Hz to 20 kHz

#### RECORD/PLAY RESPONSE, TYPE 4 TAPE (-20 dB)



Left channel (no NR) +1 1/2, -2 1/2 dB, 20 Hz to 20 kHz  
Right channel:  
no NR +1 1/2, -3 dB, 20 Hz to 20 kHz  
Dolby B +2 1/4, -3 dB, 20 Hz to 20 kHz  
Dolby C +2 1/4, -3 dB, 20 Hz to 20 kHz

#### RECORD/PLAY RESPONSE, TYPE 1 TAPE (-20 dB)



Left channel (no NR) +1/2, -2 dB, 20 Hz to 20 kHz  
Right channel:  
no NR +3/4, -2 1/2 dB, 20 Hz to 20 kHz  
Dolby B +3/4, -2 dB, 20 Hz to 20 kHz  
Dolby C +1 1/2, -2 dB, 20 Hz to 20 kHz

#### MULTIPLEX FILTER (defeatable)

-41 dB at 19 kHz

#### S/N RATIO (re DIN 0 dB; R/P; A-weighted)

	Type 2 tape	Type 4 tape	Type 1 tape
no NR	55 1/2 dB	54 dB	52 dB
Dolby B	64 1/4 dB	62 1/4 dB	61 1/4 dB
Dolby C	69 dB	68 dB	65 1/2 dB

#### INDICATOR READINGS FOR DIN 0 DB (315 Hz)

Type 2 tape	+1 1/2 dB (with 1.03% THD)
Type 4 tape	+1 1/2 dB (with 1.66% THD)
Type 1 tape	+1 dB (with 0.60% THD)

#### INDICATOR READINGS FOR 3% DISTORTION (315 Hz)

Type 2 tape	+4 3/4 dB (for +3 dB DIN)
Type 4 tape	+4 dB (for +2 dB DIN)
Type 1 tape	+5 1/2 dB (for +4 1/2 dB DIN)

#### DISTORTION (THD at -10 dB DIN; 50 Hz to 5 kHz)

Type 2 tape	≤ 1.81%
Type 4 tape	≤ 0.87%
Type 1 tape	≤ 0.71%



<b>ERASURE (at 100 Hz)</b>	
Type 2 tape	72 dB
Type 4 tape	50 dB
<b>CHANNEL SEPARATION (at 315 Hz)</b>	
	43 dB
<b>INDICATOR "BALLISTICS"</b>	
Response time	≈ 4 msec
Decay time	≈ 1,600 msec
Overshoot	0 dB
<b>SPEED ACCURACY (105 to 127 VAC)</b>	
	0.3% fast
<b>FLUTTER (ANSI weighted peak; R/P)</b>	
	±0.072%
<b>SENSITIVITY (re DIN 0 dB; 315 Hz)</b>	
line input (low)	115 mV
line input (high)	11.2 mV
<b>INPUT OVERLOAD (clipping at 1 kHz)</b>	
line input (low)	5.5 volts
line input (high)	0.63 volt
<b>INPUT IMPEDANCE</b>	
	160k ohms
<b>OUTPUT IMPEDANCE</b>	
fixed	290 ohms
variable	47 ohms
<b>MAXIMUM OUTPUT (from DIN 0 dB)</b>	
fixed	0.77 volt
variable	3.8 volts

tape length in use, so that the times shown are always accurate. And the counter keeps up with fast-winds in this mode, too—something that can't be said for many other such devices.

Another interesting touch is that fast-winds are done at a constant speed, which is good for the tape (because it spools more evenly) and helpful when you want to wind a specific distance into the tape (because you can time it). Moreover, you have a choice of two speeds plus an audible cue mode and a rocking mode (Tandberg calls it step-search) for homing in on an exact point on a tape. The degree of control is

extraordinary, more what you'd expect from a professional recorder than from a home deck.

Control is also the name of the game for the meters, which—because they are analog and therefore continuous—permit very fine adjustments of the tape-matching controls. When recording, however, they can be a little difficult to read, especially at a distance; and their side-by-side arrangement makes judging channel balance more of a challenge than it is with decks having conventional over-and-under LED indicators. The meter ballistics are exemplary, by the way, exhibiting absolutely no overshoot—quite a feat for a swinging-needle design. And they are equalized to complement the overload curves of typical tapes. Tandberg has championed this approach for many years, and they are absolutely right, particularly with cassettes, which can get into trouble very quickly at high frequencies. In fact, the meters have a separate scale for metal tape, with the zero point approximately 4 dB higher than for other formulations, in recognition of the superior high-frequency headroom of Type 4 tapes.

Playback response is unusually extended and shows excellent azimuth agreement with the BASF standard test tape. The rise at the very top of the range is characteristic of modern decks that compensate in their playback equalization for head-gap losses and is not indicative of any flaw in the design. Diversified Science Laboratories used tapes recommended by Tandberg for its record/play tests, all Maxell formulations: XL-IIS as the Type 2 ferricobalt, MX as the Type 4 metal, and

XL-IS as the Type 1 ferric. Following its usual practice, the lab adjusted the deck for each tape before making any measurements. As you can see from the curves, the resulting response in all three cases extends across the entire audible band. But more important is the smoothness of the curves, which ranges from very good for the Type 1 and 4 tapes to excellent for the Type 2. Dolby tracking (indicated by the match between the curves with and without noise reduction) is quite good as well: within a dB or so across the entire range.

Erase with metal tape is not as good as we would like to see, and the flutter, though low relative to what we see from most other models, is a shade higher than we would have expected from a deck in this one's price and technology range. Neither is much cause for concern, however, and the remainder of the data is more than reassuring. In particular, we are impressed with the machine's performance at high recording levels. At -10 dB (re DIN 0 dB), treble response is as extended as it is for many other cassette recorders at -20 dB. Perhaps we can thank Dyneq for this.

The TCD-3014A is not a deck we would recommend to a casual recordist, who could satisfy his needs and tastes at a much lower price. Instead, it should appeal to the buyer who is serious about the art of recording but still wants a machine that can be used effectively by others less knowledgeable. For that buyer, the latest from Tandberg is a dilly of a deck, offering construction, performance, and features seldom seen in consumer tape equipment.

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## TEST REPORTS

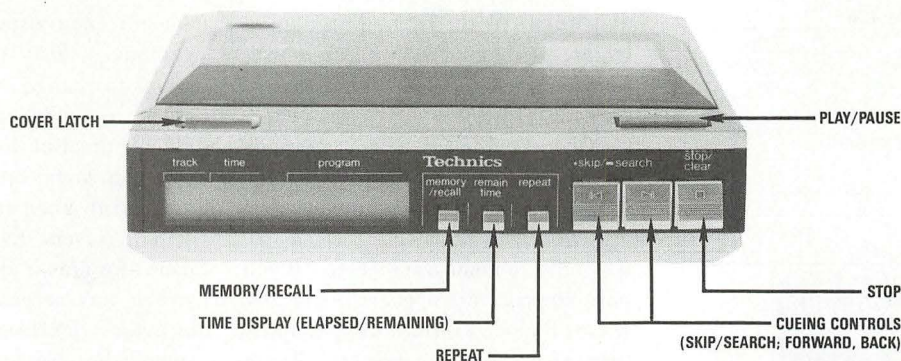
# Technics SL-XP7 Portable Compact Disc Player

**DIMENSIONS:** 5 BY 5 INCHES (TOP), 1 1/4 INCHES HIGH WITH COVER CLOSED, ADDITIONAL 4 INCHES ABOVE NEEDED TO OPEN COVER FULLY; SH-CDN7 BATTERY-PACK/CARRYING-CASE ACCESSORY, 5 1/4,

BY 6 INCHES (TOP), 2 1/4 INCHES HIGH WITH COVER CLOSED, ADDITIONAL 5 1/4 INCHES ABOVE AND 1/2 INCH AT BACK NEEDED TO OPEN COVER TO VERTICAL. PRICE: \$300; SH-CDN7 CASE, \$50. WARRAN-

TY: "LIMITED," TWO YEARS PARTS AND LABOR. MANUFACTURER: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD., JAPAN; U.S. DISTRIBUTOR: TECHNICS, 1 PANASONIC WAY, SECAUCUS, N.J. 07094.





Billed at the time of its introduction as "the world's smallest Compact Disc player," the SL-XP7 is almost identical in size to three of the "jewel box" cases in which most CDs are packed. In fact, it's about as small as CD players are likely to get (though one manufacturer already has picked up the challenge and produced a still smaller competing model). Squeezing the necessary electronics into such tiny spaces is the least problematic part of this technology. The trick is to design a servo drive and a laser pickup that will do the job in tight quarters. Technics's solution is the FF-1 Fine Focus Single-Beam system, the core of the SL-XP7.

As delivered, the player includes an AC adapter and an interconnect cable (miniature stereo phone plug to dual pin plugs) to drive the aux input of a stereo system from its line-output jack. For portable use, you'll need the SH-CDB7 carrying case (incorporating a rechargeable NiCad battery pack and a strap) and a pair of headphones with a miniature ( $\frac{1}{8}$  inch) phone plug—which virtually all current lightweight headsets have.

To assemble a portable system, you disconnect the AC supply from the player, insert the player into the case (which automatically makes electrical connection to the NiCads), and plug the AC supply into the case (to charge the battery pack). A switch gives you the option of running the player from the AC, as long as the adapter is attached, whether or not the batteries are charged. The batteries are rated for a three-hour playing time and an eight-hour recharge cycle.

The top lid (or lids, if you're using the case) opens wide enough for the disc to be dropped directly onto the spindle. This means that the objective lens of the laser pickup is more ex-

posed than in typical home players, but the wide opening makes cleaning easy as well. (The owner's manual suggests removing any visible dust with the sort of puffer or brush used on camera lenses, any fingerprints with a cotton swab.) When you close the lid, the number of tracks registers on the liquid-crystal display as a series of numbered boxes (as many as 15, beyond which a ">" appears). Also shown are the total number of tracks and the total playing time; after you begin play, these digits shift to show the current track and its elapsed time.

To program a playback sequence, you first press either of the cueing keys (to step the track number up or down); when you then press MEMORY, all the numbered boxes disappear except that for the chosen track, and the selection number (assigned serially by the player) appears in place of the time. Stepping to a different track and pressing MEMORY adds the corresponding numbered box to the display so that you can keep account of which tracks have been programmed. Once you press PLAY to begin the sequence, you can verify it by pressing MEMORY again, at which point the display will automatically step through the whole sequence. Consecutive tracks are joined seamlessly in programmed play (an improvement over the performance of many more expensive home players, which often produce small clicks or other artifacts that intrude at the break between one programmed selection and the next).

If you press the cueing keys during play, the output volume drops somewhat and the pickup scans across the disc in the indicated direction, sampling the music as it goes. The traversal speed is fairly slow at first, but it increases if you keep your finger on the key for more than a few seconds. To

All data were obtained using the Sony YEDS-7, Technics SH-CD001, Philips 410 055-2, and Philips 410 056-2 test discs.

#### FREQUENCY RESPONSE

left channel	+ 1/4, - 3/4 dB, 20 Hz to 20 kHz
right channel	+ 1/4, - 3/4 dB, 20 Hz to 20 kHz

#### DE-EMPHASIS ERROR

left channel	+ < 3/4, - 0 dB, 1 to 16 kHz
right channel	+ 1/2, - 0 dB, 1 to 16 kHz

CHANNEL SEPARATION (at 1 kHz)	85 1/4 dB
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CHANNEL BALANCE (at 1 kHz)	$\pm$ < 1/4 dB
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#### S/N RATIO (re 0 dB; A-weighted)

without de-emphasis	90 1/2 dB
with de-emphasis	94 dB

#### HARMONIC DISTORTION (THD + N; 40 Hz to 20 kHz)

at 0 dB	$\leq$ 0.21%
at -24 dB	$\leq$ 0.046%

#### IM DISTORTION (70-Hz difference; 300 Hz to 20 kHz)

at 0 dB	$\leq$ 0.028%
at -10 dB	$\leq$ 0.01%
at -20 dB	$\leq$ 0.022%
at -30 dB	$\leq$ 0.01%

#### LINEARITY (at 1 kHz)

0 to -70 dB	no measurable error
at -80 dB	- 1/4 dB
at -90 dB	+ 3 1/4 dB



# TRACKING & ERROR-CORRECTION

maximum signal-layer gap	700 $\mu\text{m}$
maximum surface obstruction	> 800 $\mu\text{m}$
simulated-fingerprint test	pass

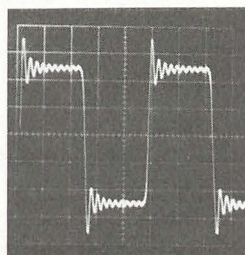
# MAXIMUM OUTPUT LEVEL

line output	1.74 volts
headphone output	1.24 volts*

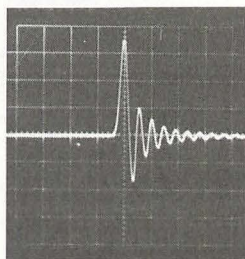
# OUTPUT IMPEDANCE

line output	1,025 ohms
headphone output	69 ohms

# SQUARE-WAVE RESPONSE (1 kHz)



# IMPULSE RESPONSE



\*See text.

skip forward to the beginnings of tracks, you must first go into PAUSE, then tap one of the cueing buttons once for each track.

Operation of the REPEAT depends on the mode from which you summon it. In normal playback (begun by pressing PLAY with no cueing commands), the entire contents are repeated; if you have stepped to a specific track, that will be the one to which the pickup returns after the remainder of the disc; in programmed play, the entire selected sequence is repeated. Pressing STOP cancels programming and repeat modes. You can toggle back and forth at will between elapsed- and remaining-time displays during playback. In other words, despite its very simple control scheme, the SL-XP7 has as complete a range of operating features and modes as many full-size domestic players.

There are two additional controls intended specifically for listening on-the-go, located next to the headphone jack on the right side of the player. One is the headphone volume control, and the other is a sort of two-position treble adjustment. The manual says simply that this "high filter" is to be turned on "if high-range sound is too strong." In trying the player with a variety of lightweight headsets that seemed appropriate, we discovered that there were big differences in the degrees to which each needed the filter. We suspect that this is mainly a question of the headphones' treble smoothness, with the rougher models creating the harshest effects from the unmodified output.

With the filter off, Diversified Science Laboratories measured quite flat response, with a slight prominence (approaching  $\frac{1}{2}$  dB) centered on 9 kHz and a steep cutoff above 18 kHz—that is, only a hair less flat and less extended at the high end than we've come to expect in home equipment. The cut provided by the high-frequency adjustment switch is so gentle—only about 3 dB per octave—that it's more of a roll-off than a filter, but its response is already 3 dB down at 3.5 kHz, so it really takes a sizable chunk out of the upper treble.

When used "flat," the Technics is perhaps a hair brighter in sound than some models we've tested, but it certainly isn't extreme in this respect and

doesn't exaggerate any headphone peakiness. Why the sound quality seems to change so much from headphone to headphone, we aren't altogether sure. But we do know that some CDs can sound quite unpleasant and unnatural when reproduced flat on some headsets. Even though the numerically drastic effect of the treble switch isn't necessarily very natural, on average it offers an improvement—sometimes a big one.

The headphone output shown in the data was measured with a 50-ohm load; into a higher impedance, it would be greater (as much as 4.91 volts into an open circuit). These voltages represent clipping level. With the volume all the way up, a 0-dB signal (the absolute highest that can possibly exist in the medium) is clipped. This isn't a practical limitation, however: There's more than enough oomph at the headphone output, and we would never want to turn the player up full with any of the headsets we tried.

No portable or automotive CD player we've yet auditioned—including the SL-XP7—has been totally immune to shock. Perhaps there will someday be a model that we would be happy to go jogging with. Meanwhile, the cassette portable still strikes us as the al-fresco medium of choice, despite its tendency to excessive wow during active pursuits. Sharp jostlings caused our sample of the Technics portable to mistrack—as did the two grossest signal-layer-interruption patterns on the Philips test disc. But in sedentary activities and with discs that have been properly pressed and maintained, tracking performance is good even by the high standards of the CD medium.

The real point of the SL-XP7's portability is that you can carry this level of performance with you wherever you want and listen beyond reach of AC lines. At almost three pounds for the player plus the battery/case assembly, it does weigh you down more than most pocketable tape players or radios. But when you finally arrive at your destination and deposit it on a convenient firm surface, it will supply finer listening than either of the less burdensome music-makers. And, not incidentally, when you return to the AC outlets, you can plug it into your home system, adding CD capability at minimum cost.

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# COMPACT DISC REVIEWS

Critics rate more than 60 Classical, Pop, and Jazz releases.

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**COMPACT DISC REVIEWERS:**

**ROBERT E. BENSON**

**IRVING KOLODIN**

**CHARLES MCCARDELL**

**JEFF NESIN**

**K. ROBERT SCHWARZ**

**MICHAEL ULLMAN**

**BILL ZAKARIASEN**

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## COMPACT DELIGHTS

A noted critic evaluates the new medium.

**BY IRVING KOLODIN**

In the years since I first encountered it in a demonstration at a 1982 trade show at the Rye (N.Y.) Hilton, the Compact Disc has progressed in myriad ways. On that occasion, the names associated with the medium were Sony and Philips. Discussion centered on highs and lows, phenomenal clarity of sound, and lack of tonal distortion. Now, as the succeeding comment makes abundantly evident, the top names in CD belong to the performers: to violinist Itzhak Perlman and conductor Zubin Mehta, to leader Herbert von Karajan and the Vienna Philharmonic, to soprano Kiri Te Kanawa and up-and-coming conductor Jeffrey Tate. They can be heard on recently issued discs in works of such composers as Khachaturian, Verdi, and Villa-Lobos. I have also sampled the accomplishments of dozens of other artists in compositions by

Brahms, Delius, Copland, et al. All performances are reproduced with a quality of sound rarely, if ever before, available for home consumption.

To move from generalities to specifics, the first of the above-mentioned partnerships is the "bread and bone" of music making. I recall a 1984 occasion when Perlman took advantage of the presence in New York's Avery Fisher Hall of his "home town" orchestra (the Israel Philharmonic) to sit in unobtrusively in its back row. His performance on CD of Khachaturian's Violin Concerto with the same group, under Mehta, is a musical miracle that transcends praise (Angel EMI CDC 47087). If anybody should ask how Perlman's effort on this CD compares with the playing of Jascha Heifetz, the answer is: This is a work that Heifetz never recorded, done in a way that only a Perl-

man can muster (or master). And to fill out the disc with Tchaikovsky's *Meditation* is to provide a nearly ten minute encore of violinistic eloquence (as orchestrated by Alexander Glazunov, because the composer never got around to it) not often encountered.

Another kind of tonal and temperamental distinction is achieved in the newest recording of the Verdi Requiem, the most fulfilling one that Herbert von Karajan (who has done it twice before) has led. This two-disc set (Deutsche Grammophon 415-091-2) includes not only a peerless effort by Anna Tomowa-Sintow, Agnes Baltsa, José Carreras, José van Dam, the Vienna Philharmonic, and the chorus of the Vienna State Opera (plus the chorus of the National Opera of Sofia, for its excellent low voices) but a dispersion of sound that foretells what will someday



also be *seen* when the TV/video version is released by Telemondial.

Here is something that surpasses those not uncommon concert performances of this demanding work in which the conductor often has to answer, when criticized about a vocal quartet that lacks the *right* fourth voice, "I'm sorry, I couldn't get the one I *really* wanted." Judging not only by the beautifully balanced nuances of Tomowa-Sintow and Baltsa but by the superb Hostias of Carreras and the rich resonance of Van Dam in the Mors stupebit, Karajan scheduled this project for just *when* and with *whom* he could get what he wanted. In keeping with it all is a booklet with good, clear notes in three languages.

Winning distinction in a different part of the repertory is a more than fulfilling re-creation of the *Chants d'Auvergne*, one of the world's greatest assemblages of folk music, powerfully and thoughtfully orchestrated by that great synthesist Marie-Joseph Canteloube de Calaret (1879–1957). In years gone by, the choicest performer of this enchanting music was Madeleine Grey, though she had some ambitious successors in the later LP versions by Victoria de los Angeles and others. Now, however, the collection has been recast with almost infallible results by London on two separate fine-sounding discs, with Kiri Te Kanawa as the brilliantly chosen soprano (Vol. 1: CD 410004-2; Vol. 2: CD 411730-2). And her selection of 36 songs expands on what has been, to my knowledge, previously available. The project is in the hands of Jeffrey Tate, who has led several well-conducted performances at the Metropolitan Opera.

For the collector on a budget, I would recommend Vol. 2 of the *Chants*. The reason—not to discriminate against Vol. 1, which contains some of the best, most familiar Auvergne songs—is that Vol. 2 contains the superb *Bachianas Brasileiras* No. 5 of Villa-Lobos. First choice has settled over the years on the historic version by Bidú Sayão, but Te Kanawa comes close to her predecessor vocally, and the treatment of the background, as performed by cellist Lynn Harrell, is in itself memorable. Since these pieces

are destined to become a repertoire item that Te Kanawa must add to her concert-giving, why not improve the delivery of the mountain-lying, "south of France" text? Her sound is too good for her present blurry syllables.

Scanning the recent score of diversified CDs, comment settles on the fraction of chamber, orchestral, vocal, and other music that have certain virtues in common. These virtues are not merely top-notch sound—which is a *sine qua non* of current recording—but personal involvement on the part of the performers.

Outstanding among recent chamber music discs is a Chandos CD of generous length highlighting Yuli and Eleonora Turovsky, who migrated (*not* defected) from the Soviet Union during the past decade, settling in Quebec. Yuli is an excellent cellist, currently with the Borodin Trio; Eleonora, a quality violinist. Together they are featured on a first-rate CD (Chandos 8358) devoted to an assortment of works for their instruments by Ravel (his Sonata), Jean Rivier (his Sonatine), Honegger (his Sonatina), and Martinů (his Duo). The Ravel and Honegger works are highly representative of their composers; the Rivier, a product of a man who will be ninety on his next birthday. The Martinů is a good instance of why his works were much performed when he was living in America during World War II. Most appealing of all is the engagement of the Turovskys in what they are doing: playing music they love and making the listener share in it.

Yuli is a participant in two other recent CD productions for Chandos. The first contains two trios of Rachmaninoff, which Turovsky performs with his Borodin Trio colleagues, violinist Rostislav Dubinsky and pianist Luba Edlina (Chandos 8341). The extended slow movement of Trio No. 1 in G minor, Op. Posth., is followed by the three-movement Trio No. 2 in D minor, Op. 9. Both are produced out of love rather than merely because of an open microphone. Each has an amount of repetition that must be endured, but they also wear well. In the second release, the same ensemble performs the three trios of Brahms (Chandos 8334-5). The packaging of an integral sequence

of works in one box presents a different kind of problem for the collector: Is the temptation to acquire the three works by the one-and-only Mr. Brahms overpowering, or is it more prudent to wait for the item you really prefer? These trios are unquestionably well performed, but my heart goes out to the last of them, Trio No. 3 in C minor, Op. 101. Here, taking into consideration everything that has preceded, Brahms finally knows how to write a trio, and he does it wonderfully well.

Among orchestral CD selections, the most recent effort of Klaus Tennstedt with the Berlin Philharmonic (Angel EMI CDC 47071) possesses two virtues: The orchestra is content to give this former resident of East Germany the best of which it is capable, and he has not merely a decent set of values vis-à-vis Dvořák's Symphony No. 9 but a whole range of insight and discrimination to cherish. One factor to consider: Are the 41 minutes of Dvořák's Ninth all that a CD should contain, or isn't there a belief that another ten minutes of content comes closer to full value?

This query aside, the inclusion on Unicorn-Kanchana of over 50 minutes of Frederick Delius digresses from such common music as *Summer Night on the River* to include his Violin Concerto, written in 1916 and, if memory serves, not recorded in about 20 years (DKP 9040). Here the honors are shared by soloist Ralph Holmes and conductor Vernon Handley leading the Royal Philharmonic. The well-colored outside cover of the CD bears an inscription reading "Recorded under the Auspices of the Delius Trust," which speaks for itself. This is relatively appropriate terminology, for the late Holmes was a violinist of truly Deliusian aptitudes, who sang out from start to finish. He also commands the kind of vibrato very much suited to the intimacies of Delius. The backing by Handley brings out the horn and harp decorations very much as the composer intended. Also included are 18 or so minutes of a Delius work for violin and orchestra titled *Suite* and a much briefer *Légende* for the same forces. Both are identified as first recordings, and both suffer from rather muffled sound



that lacks definition.

Orchestral material not likely to be duplicated soon is contained on a Varèse Sarabande CD that bears the superscription "American Composers" (VCD 47211). In this instance, the composer is Aaron Copland and the featured offering a relatively early (1937) work that was produced for a radio broadcast and derived its title, *Saga of the Prairies*, from a poll of listeners. With it is Samuel Barber's *Capricorn Concerto* of 1944 and his *First Essay* of 1937. Copland's *Saga of the Prairies* bears indications of some Americana to come, as does Barber's *Capricorn Concerto* of his own emerging colorations. The performances are by the Pacific Symphony (of Orange County, California), whose director, Keith Clark, is a product of Tanglewood. Whatever else he is qualified to interpret, Clark knows his way around these works. The sequence of 53 minutes not only includes Copland's lively *Outdoor Overture* of 1938, written for the orchestra of the New York High School of Music and Art, but also an orchestration by David Porter of the overture from Charles Ives's *Third Orchestral Set*, billed as a world premiere recording. The reproduction techniques are under sure control, and the accompanying booklet includes material by Edward Tatnall Canby, Edward Cole, Porter, and Copland himself.

Varèse Sarabande has also re-

leased a disc—at some musical distance from Copland, Barber, and Ives, but in the same neighborhood when it comes to quality—that bears, extraordinarily, a total of 19 items from Frederick Loewe and Alan Jay Lerner's *Camelot* (VCD 47206). The reference to the number of the disc's selections is in no way an apology for what is left out, but a blessing for what is included, under the stirring musical direction of Gerry Allison. Herein preserved is the total content of London's 1982 stage production, which is led—and how!—by Richard Harris as King Arthur. Having seen the original New York show of 1960 and its reverberant renewal at the New York State Theater in 1980, with Richard Burton in *both*, I can only, while shedding a mournful tear for the late performer, remember specifically what he did so well. Burton spanned the 20 years between his two endeavors by carefully contriving to match such a passage of time in the King's own life. That is, as a young man, he anticipated with hope and enthusiasm what might come about in *Camelot*; later, he looked back on it, with fondness and affection.

Similarly, Harris has projected with great understanding what is contained in songs from "I Wonder What the King is Doing Tonight" to "How to Handle a Woman," "If Ever I Would Leave You," and all the other gems that are crowned by—what else?—"Camelot" itself. Included in what is

preserved from the 1982 Varèse Sarabande production (recorded in the Abbey Road Studios of EMI) are touching participations by Fiona Fullerton (Guenevere), William Squire (Merlin), Michael Howe (Mordred), and the rest of the cast. One element not to be ignored is the intention that prevailed during the sessions: to maintain and sustain the atmosphere of the *theater* as the performance was taking place, rather than to convert the studio into a Valhalla of Wagnerian sound. Worth every penny—or, if it may be said, every farthing—of what is being asked.

For another kind of re-creation of this literature, in the broadest sense, how about Jessye Norman enjoying herself in a dozen-plus items, backed by the Boston Pops under the direction of John Williams? The selections here (Philips 412 625-2) include works by Richard Rodgers and Lorenz Hart, Cole Porter, Jerome Kern and Johnny Mercer, Harold Arlen and Truman Capote, and the Gershwin brothers. To the credit of Miss Norman, she treats every *word* of the lyricists with the same high regard and clarity as she does the music with which they have been fixed in memory.

Lest one derive from the preceding abundant sampling a fixed and final impression that CD has reached its zenith, consider that the medium is more likely only in the pioneering stage of its accomplishments. Imagine the delights that lie ahead. . . .

VS

# CLASSICAL

## ACADEMY OF ST. MARTIN-IN-THE-FIELDS:

### French Orchestral Works.

Ellis; *Academy of St. Martin-in-the-Fields*, Marriner. Anthony Sargent, prod. Vanguard CD 25019 (D).

DEBUSSY: *Danse sacrée et danse profane*. FAURÉ (orch. Rabaud): *Dolly Suite*, Op. 56. IBERT: *Diversissement*, from "Un chapeau de paille d'Italie." RAVEL: *Le Tombeau de Couperin*.

One has to be pretty hard-boiled not to find some enjoyment in this CD; in-

deed, it might almost have been conceived as a colorful Gallic litmus test for curmudgeons. Neville Marriner emphasizes transparency of texture here, and his interpretations are executed gracefully and smartly by the Academy of St. Martin-in-the-Fields. Their playing is light without making light of the music—no small accomplishment in a program of works having a certain precious quality about them.

The uncredited stars are the woodwinds, who play with ingratiating, at

times hypnotic, effect, especially in the orchestrated piano works of Ravel and Fauré. The Academy so completely locks into all the scores that the music practically plays itself. Only once, and briefly, do things get out of hand: The surging strings near the conclusion of Debussy's *Danses* momentarily upstage harpist Osian Ellis.

Marriner and company have a rollicking good time with the Ibert *Diversissement*. In the course of six movements, this Satiesque pastiche quotes Mendelssohn's *Wedding March* from





THE FITZWILLIAM QUARTET

*A Midsummer Night's Dream* and sends up the "Waltz King" Strauss, with an anything-goes attitude reminiscent of the music hall.

Vanguard's digital recording, first issued some time ago on an Academy Sound & Vision LP imported from the United Kingdom, is clean and convincingly spacious. C.M.

#### BEETHOVEN:

**Quartet for Strings, No. 13, in B flat, Op. 130; Grosse Fuge in B flat, Op. 133.**

*Fitzwilliam Quartet. Peter Wadland, prod. London 411 943-2 (D).*

In any discussion of Opus 130, the inevitable question arises: Should the work conclude with the *Grosse Fuge*, as originally conceived, or with the replacement finale that Beethoven wrote at the suggestion of his publisher, Matthias Artaria? The Fitzwilliam Quartet sides with the composer (the *Grosse Fuge* is sequenced before the finale) for reasons violist Alan George elucidates in his program notes. History has willed otherwise, but with this CD, listeners can conveniently weigh both options by utilizing their machines' programming capabilities.

George's remarks and the group's reading make a strong case. The *Grosse Fuge*, despite its furious dissonances, gloriously summarizes the preceding five movements' disjunctive tempos, rhythms, and key relationships. In length alone, it balances the sprawling first movement, in which the quartet observes all repeats.

Their attentiveness to the score seems to unleash a nervous energy that in turn gives this account an excitable quality. You won't find the aristocratic grandeur and even-keeled

warmth of the Guarneri; tempos tend to be brisk, and dramatic contrasts are boldly etched. In fact, the fourth-movement *Alla danza tedesca* swells and contracts in an exaggerated fashion that's somewhat distasteful. Yet in the ensuing *Cavatina*, which contains what is perhaps Beethoven's most touching melody ever (he admitted as much), the Fitzwilliam players linger over each phrase, wringing out every ounce of emotion with their fine ensemble work.

If it's thrilling Beethoven you seek, this Compact Disc is just the ticket. The vibrant sound complements a performance that seldom pauses for quiet reflection. C.M.

#### SCHUMANN:

**Concerto for Violin and Orchestra, in D minor.**

#### SIBELIUS:

**Concerto for Violin and Orchestra, in D minor, Op. 47.**

*Kremer; Philharmonia Orchestra, Muti. John Mordler, prod. Angel EMI CDC 47110 (D).*

Aside from the fact that they share the same key, these two works have little in common. The Sibelius concerto (1903) was written by a master violinist; though it bristles with technical difficulties, it was conceived by a man who knew how to compose idiomatically for the instrument. Schumann wrote his concerto (1853) for the great Joseph Joachim, but Joachim, citing the work's "dreadful passages," refused to perform it. Clara Schumann and Johannes Brahms concurred with this judgment, so the concerto remained unpublished and unperformed until 1938. (Unfortunately, one must admit that Joachim's verdict was not far from the truth: The virtuosic material is awkward and pedantic, the thematic content—with the notable exception of the gorgeous slow movement—is uninspired, and the formal seams are all too evident.)

Gidon Kremer's artistry in these performances is peerless. He is not afraid to plunge into the music, even if it means occasionally sacrificing tonal sheen for emotional impact. His impassioned approach calls forth sharply chiseled, sometimes brutal articula-

tions, and he aims more for virility than for elegance. Yet he possesses an absolutely sumptuous tone and, when he wishes to, can produce passages of pristine delicacy and luscious lyricism.

Kremer's crisp bow strokes serve him well at the opening of Sibelius's finale; rarely have I heard such a clean, convincing presentation of the movement's principal thematic material. His soulful playing, full of rich portamentos and rubatos, molds the slow movements into warmly Romantic effusions. And he has an impeccable technique, so that even the clumsy figuration of the Schumann concerto sounds idiomatic in his hands.

Angel's generous (61:06) pairing of these two works has been available for several years on LP and cassette. On Compact Disc, the recording is still colored by a slightly murky sound in full orchestral sections, noticeable primarily in the strings. Yet Kremer's fiery playing and Riccardo Muti's sensitive, flexible accompaniment combine to make these the performances of choice in this format. Only the Compact Disc of Itzhak Perlman's rendition of the Sibelius with the Pittsburgh Symphony (Angel EMI CDC 47167) can offer serious competition. K.R.S.

#### SIBELIUS:

**Symphony No. 4, in A minor, Op. 63; Canzonetta; The Oceanides.**

*Gothenburg Symphony Orchestra, Järvi. Bis CD 263. (Distributed by Qualiton Imports, 39-28 Crescent St., Long Island City, N.Y. 11101.)*

#### SIBELIUS:

**Symphony No. 3, in C, Op. 52; Suite from "King Christian II," Op. 27.**

*Gothenburg Symphony Orchestra, Järvi. Bis CD 228.*

#### SIBELIUS:

**The Maiden in the Tower; Karelia Suite, Op. 11.**

*Häggander, Hynninen, Hagegård, Kruse; Gothenburg Symphony Orchestra, Gothenburg Concert Hall Choir, Panula. Bis CD 250.*

#### SIBELIUS:

**Orchestral Songs (12).**

*Hynninen, Häggander; Gothenburg Symphony Orchestra, Panula. Bis CD 270.*

The Bis label is continuing its traversal





#### A POWERFUL KLEMPERER FOR FANS

of the complete orchestral works of Jean Sibelius with generally excellent results, particularly as to sound. Sibelius benefits unusually well from Compact Disc treatment: The titanic silences that permeate so much of his output, heightened in this format, enable the big outbursts preceding and following them to make their points all the better.

The Gothenburg Symphony Orchestra is again featured on four new CDs, three of them made with music director Neeme Järvi. The Fourth Symphony, in A minor, Op. 63—always the toughest Sibelian nut to crack—receives a broad treatment that works superbly. (By the way, Järvi opts for using discreet bells as well as glockenspiel in the final movement—maybe not the purist's solution, but I like it.) The disc is filled out by the brief, rather inconsequential *Canzonetta* and a definitively pictorial traversal of *The Oceanides*. Playing time: 52:47.

Järvi's version of the Third Symphony, in C, Op. 52, is likewise an unqualified success, particularly in the last movement, though his treatment of the extensive filler—the *King Christian II* Suite—is oddly ponderous. Playing time: 54:50. The third Järvi disc is mainly devoted to Sibelius's only opera, *Jungfrun i Tornet* (*The Maiden in the Tower*). A marginal work, to be sure, but full of attractive (if mainly stillborn) music that has a built-in fascination. The performance—which features fine singing by Mari-Ann Häggander, Jorma Hynninen, and Erland Hagegård—seems meet and right. Unfortunately, the accompanying *Karelia* Suite, like the *King Christian II*, is under tempo and frankly rather lugubrious (especially in the *Alla Marcia*, which lacks the necessary swagger). Playing time:

52:19.

Jorma Panula conducts the fourth disc, which contains all the songs that Sibelius personally orchestrated. Hence, some familiar items such as "*Flickan kom ifrån sin älsklings möte*" ("*The Maiden's Tryst*") aren't included. Hynninen performs on the first half of the disc, which is the most impressive. His selections include the striking *Koskenlaskijan morsiamet* (*The Rapids-shooter's Brides*) and "*På verandan vid havet*" ("*On a Balcony by the Sea*"), two of Sibelius's finest creations for voice. Häggander's contributions on the second half are well handled, though in her most demanding one, *Luonnotar*, her lyric soprano is obviously strained. (Unfortunately, the engineers try to make up for this by overmiking her, which only succeeds in covering up some important orchestral details.) Nevertheless, a valuable collection of Sibeliana and—with the above exception—quite well recorded. Playing time: 49:04. *B.Z.*

#### ORMANDY'S BARTÓK

Eugene Ormandy and the Philadelphia Orchestra—with their "new" sound (according to the vintage 1979 recording notes)—play Bartók's *Music for Strings, Percussion, and Celeste* and the suite from *The Miraculous Mandarin*. The "new" sound was hardly an improvement over the best of their "old" recorded sound, particularly that achieved by Columbia before the Philadelphians switched to RCA years ago. The famed strings here are a touch steely, the dry acoustics of the recording site not providing desirable warmth. Fine performances, as one might expect. Playing time: 50:10. (Angel EMI CDC 47117.) *R.E.B.*

#### KLEMPERER'S BEETHOVEN

If you like your Beethoven dynamic, look elsewhere, but the legion of admirers of Otto Klemperer surely will want to have these beautifully processed, well-balanced, analog recordings. The Philharmonia Orchestra, under Klemperer's direction, plays the *Eroica* Symphony paired with *Grosse Fuge* (playing time: 70:02; Angel EMI CDC 47186) and the Fifth and Eighth Symphonies (playing time: 67:37; Angel

EMI CDC 47187). These interpretations are worthy of the permanence of CD; dating back to 1961 and 1960, respectively, they are performances of remarkable power and authority. The same accounts have been issued on Angel DMM pressings in the label's Eminence series, with a list price of \$6.98 per LP. Unfortunately, no such semi-budget price exists for CDs. *R.E.B.*

#### HEIFETZ SPECTACULAR

Jascha Heifetz recorded Beethoven's Violin Concerto with Charles Munch and the Boston Symphony in 1959 and the Brahms Violin Concerto with Fritz Reiner and the Chicago Symphony in 1955. Both are now available on a single CD, sounding better than ever. The soloist is not unduly spotlighted, and what a pleasure it is to hear the quiet opening timpani beats of the Beethoven via CD. These are, of course, analog recordings, but they are of the highest quality. Playing time: 72:12. (RCA RCD 1-5402.) *R.E.B.*

#### BEATIFIC BRAHMS

Robert Shaw, who conducted the first American recording of Brahms's *Ein deutsches Requiem* in 1947, now leads a considerably more spacious performance of it. Barring a bit of scrappy ensemble at the outset, the Atlanta Symphony Orchestra and Chorus do splendid work, and there is fine soloing from soprano Arleen Augér and baritone Richard Stilwell. Despite his notably slow tempos (at least in comparison with his former account), Shaw keeps things moving. Thanks in part to the stupendously wide-ranging sound of the CD, the climaxes roar forth with all the power one could desire. Moreover, the especially firm bottom end in this recording registers the important organ obbligato with far more strength than any previous recorded rendition has achieved, and hall resonance is just right. The disc's length makes it excellent value. Playing time: 69:46. (Telarc CD 80092.) *B.Z.*

#### CANADIAN BRASS

*High, Bright, and Clear: The Glory of Baroque Brass* is the title of an RCA collection that features the Canadian Brass playing works of Scheidt,





PHOTO BY ROBERT M. LIGHTFOOT III

#### **SOLTI DELIVERS DAZZLING MAHLER.**

Mouret, Bach, Purcell, Boyce, Reiche, and Clarke. Recorded in the Cathedral Church of St. James in Toronto, this disc wonderfully captures the rich, warm acoustics. Surely one of the finest CDs of its kind. Playing time: 50:43. (RCA RCD 1-4575.) *R.E.B.*

#### **CHOPIN "PRELUDES"**

Maurizio Pollini's mid-Seventies analog recording of Chopin's *Preludes* is now on CD. These are highly acclaimed performances, well recorded, but with such a short playing time (36:18), the disc is hardly a bargain. Surely Deutsche Grammophon could have found *something* else to add. (DG 413 796-2.) *R.E.B.*

#### **STYLISH DVOŘÁK**

The stylistic aptitude of cellist Yuli Turovsky is handsomely demonstrated in this disc devoted to the infrequently heard Third Piano Trio, in F minor, Op. 65, of Dvořák, in which Turovsky is joined by the other members of the émigré Borodin Trio: pianist Luba Edlina and violinist Rostislav Dubinsky. This work is distinctly different from some of the composer's others in that its musical content is not "folkloric." Nevertheless, it is wholly expressive of his abiding personality and is well served in this appealing performance. Playing time: 43:08. (Chandos CD 8320. Distributed by Harmonia Mundi, U.S.A.) *I.K.*

#### **ELGAR FOR KIDS AND OTHERS**

Here is another winner from Chandos: a generous coupling of some of Elgar's music pertaining to the world of children. *The Wand of Youth Suites* Nos. 1 and 2 were written in 1907 and are orchestrations of sketches dating back to Elgar's teenage years, when he wrote music for a play set in a perfect, untainted world where ill-tempered adults are barred, a dreamland filled

with fantasy creatures. The movements include "Fairy Pipers," "Moths and Butterflies," "Fairies and Giants," "The Little Bells," and "Wild Bears," with several dances interspersed.

*Nursery Suite*, written two decades later, consists of seven similarly child-related movements: "Aubade," "The Serious Doll," "Busy-ness," "The Sad Doll," "The Wagon (Passes)," "The Merry Doll," and "Dreaming Envoy." All of this is enchanting music, beautifully played by the Ulster Orchestra led by Bryden Thomson and recorded with the richness and dynamic range that seem typical of this label. Playing time: 63:29. (Chandos CD 8318. Distributed by Harmonia Mundi, U.S.A.) *R.E.B.*

#### **"GLAGOLITIC" MASS**

The new recording of Leoš Janáček's *Glagolitic Mass* is not only the first appearance of this magnificent work on Compact Disc, it's also the finest performance it has received on any medium. Sir Charles Mackerras, leading the Czech Philharmonic Orchestra and Chorus (with a first-class solo quartet headed by soprano Elisabeth Söderström), has completely restudied the work, going back to Janáček's original manuscript and incorporating passages omitted from the published score. The differences are slight, and they would mean nothing if Mackerras didn't back up his research with a reading worthy of the music.

For ferociously ecstatic commitment, this performance stands alone. The brawny yet consistently transparent sound on CD is splendid—notably more so, by the way, than on the 12-inch counterpart. One might complain that there was plenty of room at the end of this disc for another Janáček choral work; but to be fair, no previous recording of the Mass has been any more generous. Playing time: 39:55. (Supraphon CDS 7448.) *B.Z.*

#### **PRIZE-WINNING WOODWINDS**

A recording that won the *Grand Prix du Disque 1983* is now available on CD, offering Franz Krommer's Flute Concerto in G, Concertino for Flute and Oboe in C, and Oboe Concerto in F. Peter-Lukas Graf, flute, and Heinz Hol-

liger, oboe, are the soloists with the English Chamber Orchestra, both men sharing the conducting task. Delightful, inventive music, exceedingly well played and beautifully recorded. In short, a disc that well deserves its award. Playing time: 63:23. (Claves CD 8203. Distributed by Qualiton Imports, 39-28 Crescent St., Long Island City, N.Y. 11101.) *R.E.B.*

#### **MIRACULOUS MAHLER EIGHTH**

How long yesterday's miracles will endure against today's scientific advances may well be illustrated by this classic recording of Mahler's greatest symphony, produced in Vienna's Sofiensaal more than a dozen years ago. The high level of justice achieved by the Vienna Singverein, the chorus of the Vienna State Opera, and even the Wiener Sängerknaben could perhaps be matched in another undertaking, but hardly with the equal of the touring Chicago Symphony or the timeless quality of the solo "vocal family" brought together for this production by Sir Georg Solti. Included are bass Martti Talvela, baritone John Shirley-Quirk, tenor René Kollo, mezzos Yvonne Minton and Helen Watts, and sopranos Heather Harper, Lucia Popp, and Arleen Augér.

Those accustomed to the reel-to-reel tape version (London LONK 490 211) will find that the two CDs shed further sound-light not so much on the performance as on the dazzling imagination of Mahler himself. Time is of no essence here, because it is all there on the two discs. Playing time: 79:36. (London 414 493-2.) *I.K.*

#### **MARCHES FROM SOLTI ET AL.**

London has gathered together a group of marches of one kind or another—including works by Elgar, Prokofiev, Berlioz, Meyerbeer, Mendelssohn, Tchaikovsky, and Respighi, with conductors Georg Solti, Walter Weller, Richard Bonyngé, Christoph von Dohnányi, Antal Doráti, and Charles Dutoit—that is not quite as generous a selection as one might think. These are mostly analog recordings, with variable sound quality, but the best are very good indeed. Playing time: 49:43. (London 411 954-2.) *R.E.B.*





SLATKIN MAKES UP FOR A LUMPY TRANSLATION.

## MENUHIN AND GRAPPELLI

The composer of the opening item on this disc is Max Harris, whose "Winter Set" may never win an Oscar. Yet, he merits the prominence he gets here for providing violinists Yehudi Menuhin and Stephane Grappelli the wonderful arrangements of numerous items that are indeed suitable *For All Seasons*, to quote the title of the CD. Included are Ray Henderson's "Button Up Your Overcoat," Irving Berlin's "I've Got My Love to Keep Me Warm" and "Heat Wave," Vernon Duke's "April in Paris" and "Autumn in New York," Frank Loesser's "Spring Will Be a Little Late This Year," and half a dozen others of similar quality. The good chamber-music backgrounds are furnished by a varied group of instrumentalists that adds lustre to the best of all duet outings to date by Menuhin and Grappelli—who not only think but sound as one. Playing time: 55:05. (Angel EMI CDC 47144.) *I.K.*

## REINER'S "PICTURES"

Fritz Reiner's 1958 Chicago Symphony performance of Mussorgsky's *Pictures at an Exhibition* has been a showpiece for a quarter century—and with good reason. The generous coupling with Reiner's 1960 releases of Respighi's *Pines of Rome* and *Fountains of Rome* on this CD is a somewhat dubious bonus, however. The transfer of these is atrocious, with an almost total lack of high frequencies and with a persistent low-frequency rumble. Too bad. Still, the CD is worth having just for *Pictures*. Playing time: 69:28. (RCA RCD 1-5407.) *R.E.B.*

## "PICTURES" IMPERFECT

As an example of what Ravel had in mind as an orchestral enlargement of the score Mussorgsky created for pi-

ano in tribute to the work of his friend the painter Victor Hartmann, this recording of *Pictures at an Exhibition* by Sir Charles Mackerras and the New Philharmonia Orchestra is unworthy. It tends to exaggerate everything Ravel added that needs to be restrained, such as swollen percussive sounds and excesses of trombone output. The treatment by the London Symphony Orchestra under Mackerras of the suite from Stravinsky's 1911 *Petrushka* ballet is, for the most part, well considered. Playing time: 69:15. (Vanguard 25023.) *I.K.*

## SOLTI/CHICAGO PROKOFIEV

Georg Solti and the Chicago Symphony can be heard on this spectacular Prokofiev CD containing the *Classical* Symphony as well as 17 excerpts from *Romeo and Juliet*. Both performances are extraordinary and very well recorded. Playing time: 59:57. (London 410 200-2.) *R.E.B.*

## "TURANDOT" WITH SUTHERLAND

Zubin Mehta's account of Puccini's *Turandot*—with the London Philharmonic, the John Alldis Choir, and an all-star cast headed by Joan Sutherland, Luciano Pavarotti, and Montserrat Caballé—is a welcome addition to the CD catalog. One of the finest recordings of the opera ever made, it offers vivid, wide-range sonics. London has thoughtfully issued it on two CDs, even though it required three LPs. (Someone at Polygram is thinking!) Forget Herbert von Karajan's Deutsche Grammophon recording, which has an inferior soprano and has been released on *three* CDs. Playing time: 117:33. (London 414 274-2.) *R.E.B.*

## BLOCKBUSTER "BELLS"

Some people may dismiss this account of Rachmaninoff's *The Bells* out of hand because the text is sung in English instead of Russian. True, because Poe's original English was first translated into Russian and then back into rather lumpy English for this recording, the performance loses a bit in literary. Nevertheless, Leonard Slatkin's electrifying conducting more than makes up for it. The St. Louis Symphony has never sounded better (particu-

larly in this superbly accomplished CD transfer from an originally analog source), and there is excellent work from soloists Walter Plante, Marianna Christos, and Arnold Voketaitis. Translation aside, *The Bells* rings here as in no other recorded version. The same goes for the equally fine-sounding performance of the filler, *The Isle of the Dead*, which supersedes the previous standard-setting accounts by Serge Koussevitzky and Fritz Reiner. Playing time: 54:25. (Moss Music Group MCD 10020.) *B.Z.*

## KOC SIS PLAYS RACHMANINOFF

Excellent value here in playing time, but that's about it. Pianist Zoltán Kocsis and the San Francisco Symphony Orchestra, conducted by Edo de Waart, have recorded all of Rachmaninoff's works for piano and orchestra, and this first CD released in the series comprises Piano Concerto No. 3, in D minor, Op. 30, and Piano Concerto No. 4, in G minor, Op. 40. The coupling differs from that on LP, which pairs the First and Fourth Concertos. The accounts of the final two concertos are highly disappointing: Kocsis has made some fine recordings, but judging from these rushed, prosaic performances, he understands little of the Rachmaninoff idiom. Majestic climaxes are understated, the playing lacks authority, and pianistic fireworks are few. Nor is the reproduction up to par, with an overly prominent piano. London shortly will release a Rachmaninoff cycle with Vladimir Ashkenazy, Bernard Haitink, and the Concertgebouw Orchestra. Surely *it* is worth waiting for. Playing time: 62:14. (Philips 411 475-2.) *R.E.B.*

## "DAPHNIS" DIGITIZED

Perhaps the most amazing CD yet to enter the catalog is a recording of Ravel's complete *Daphnis et Chloé* ballet by the Orchestre du Théâtre National de l'Opéra de Paris under Manuel Rosenthal—"amazing" because the recording was originally made in 1959! This performance, by the way, is *not* the one featuring the same forces that was available for a time on a Westminster album in the early 1960s: The remastered 1959 account is far better played, and Rosenthal's peerless con-





**ROSTROPOVICH: A BENCHMARK INTERPRETATION**

ducting is even more in evidence (particularly regarding his unique way with rubato).

These advantages, coupled with truly miraculous digitization, now make this *Daphnis* the preferred version. Rosenthal unlocks the poetic and balletic secrets of this gorgeous score like no other conductor; now that we can really hear what he's doing, each playing of the disc becomes an unforgettable lesson in how it should be done. There's absolutely no background interference, and balance and clarity are nigh perfect. Only a slight breakup in the loudest climaxes betrays the fact that this performance occurred over a quarter century ago. Simply fabulous in every way. Playing time: 60:56. (Adès ACD 140 742. Distributed by International Book and Record, 40-11 24th St., Long Island City, N.Y. 11101.) *B.Z.*

### MUTI CONDUCTS ROSSINI

It's surprising that the overtures of Rossini have been relatively neglected thus far on CD. Angel's 1980 analog recording of the overtures to *William Tell*, *Semiramide*, *The Barber of Seville*, *La Scala di Seta*, *Il Viaggio a Rheims*, and *The Siege of Corinth* played by the Philharmonia Orchestra under Riccardo Muti's direction is now available on CD. It is preferable to London's collection with Riccardo Chailly and the National Philharmonic, containing the overtures to *William Tell*, *La Gazza Ladra*, *L'Italiana in Algeri*, *Il Turco in Italia*, *Il Signor Bruschino*, *Il Viaggio a Rheims*, and *La Scala di Seta* (London 400 049-2). Angel's analog reproduction is well balanced and more pleasing than London's rather sharp, unresonant digital sonics. Playing time: 52:13. (Angel EMI CDC 47118.) *R.E.B.*

### ROSSINI SONATAS

Four of Rossini's sonatas for strings

(Nos. 1, 4, 5, and 6) are available on a Teldec CD featuring the Franz Liszt Chamber Orchestra directed by János Rolla. Rossini's bright, captivating music is well played, though with no outstanding sparkle. The sound is not as well defined and pleasing as on some earlier analog recordings by the same group. Playing time: 57:06. (Teldec CDT 43109. Distributed by Intersound, Inc.) *R.E.B.*

### SATIE TREASURE

Erik Satie's status as a "precursor" to better-known French composers was somewhat altered by the production at the Metropolitan Opera several years ago of a triptych capped by his *Parade*. Beyond that, there is much to be learned from the content of these three CDs featuring the Tokyo-born Yuji Takahashi. They follow a sequence from the earliest *Gymnopédies* of 1888 to the later works for two pianists, performed by Takahashi and Alain Planès, including the original *Parade* plus other music for the stage. Altogether, a very good acquisition, whose duplication is unlikely and whose availability may be of uncertain duration. Playing times: 53:16, 43:27, 49:59. (Denon 7485/86/87.) *I.K.*

### SHOSTAKOVICH'S SOUL

Mstislav Rostropovich conducted the National Symphony Orchestra in a cataclysmically definitive presentation of Shostakovich's Symphony No. 5, in D minor, Op. 47, for Deutsche Grammophon four years ago. That account can now be heard to even greater effect in the CD format. The slightly bleary tone that afflicted the sound on analog disc—and, to a lesser extent, on cassette—is nowhere to be heard. The clarity of orchestral texture, particularly in contrapuntal string passages, is fabulous, as is the realistic duplication of the Kennedy Center Concert Hall acoustics. A benchmark interpretation has finally received its sonic due. Playing time: 45:34. (DG 410 509-2.) *B.Z.*

### SMETANA STRING QUARTETS

For those to whom "the" Smetana quartet is the one in E minor ("From My Life"), the plural "quartets" may seem a misprint. This disc, however, in-

cludes a satisfying version of the later Quartet No. 2, in D minor, that extends the considerable high regard I feel for this composer as a master of many forms. Credit the leadership of Jan Novak for two distinguished performances by the Smetana Quartet (recorded in 1976). Playing time: 46:06. (Denon 7339.) *I.K.*

### STARRING STOKOWSKI

Some of the last recordings of Leopold Stokowski are now available: a 1975 collection of ten of his own transcriptions, including an outrageous *Stars and Stripes Forever*, the *entr'acte* from Mussorgsky's *Khovanshchina* (which has an absolutely stupendous tam-tam stroke), Saint-Saëns's *Danse macabre*, and works of Johann Strauss, Ippolitov-Ivanov, Chabrier, Haydn, Brahms, Tchaikovsky, and Berlioz. The National Philharmonic Orchestra is at its best, and the engineers have done a first-class job. Lots of fun indeed. Playing time: 55:58. (PRT CDPCN 4. Distributed by Com-pleat.) *R.E.B.*

### STRAUSS'S "SALOME"

This CD release of Richard Strauss's *Salome* is a stunning sonic achievement, even though it was recorded in the early '60s. Performed by the Vienna Philharmonic Orchestra, with Sir Georg Solti conducting, this account was issued on LP as the first of the Decca/London "Sonicstage" productions—sort of a predecessor to the label's Phase Four Series. Orchestral sound is magnificent, and I find the balances between the orchestra and the voices of Birgit Nilsson (Salome), Grace Hoffman (Herodias), Gerhard Stolze (Herod), Eberhard Waechter (Jochanaan), and others to be near ideal, far superior to those achieved in the majority of recent digital opera recordings.

The performance itself is high-powered. To me, Nilsson is no Salome, but she trumpets her way through the score with incredible security. (I look forward to the announced CD issue of the Solti-Nilsson collaboration on *Elektra*.) A complete libretto is provided with the two-CD package. Playing time: 99:26. (London 414 412-2.) *R.E.B.*





PHOTO BY SUSSESH BAVAT COURTESY DEUTSCHE GRAMMOPHON

**ARGERICH: A BRILLIANT PIANO PERFORMANCE**

**"ZARATHUSTRA" FROM SOLTI**

Georg Solti and the Chicago Symphony score high with this generous Richard Strauss coupling, offering not only *Also sprach Zarathustra* but *Don Juan* and *Till Eulenspiegel* as well. The latter two are extraordinary performances played with incredible virtuosity, the CD transfer quite superior to the LP counterpart. *Zarathustra* is fine once you get past the opening, with its oil-can timpani and electronic organ. Playing time: 63:22. (London 414 043-2.) *R.E.B.*

**STRAUSS WALTZES FROM REINER**

Fritz Reiner, one of the leading exponents of the music of Richard Strauss, was less effective with the music of Johann and Josef, as this RCA compilation of waltzes—with one polka thrown in for good measure—makes evident. These are somewhat square readings, but they are sumptuously recorded—analogue, of course, but with better sound than the majority of digital CDs currently on the market. Playing time: 73:16. (RCA RCD 1-5405.) *R.E.B.*

**STRAUSS, WEBER SOLO HORN**

Hermann Baumann, an East German horn virtuoso, recently signed a recording contract with Philips. Accompanied by the Leipzig Gewandhaus Orchestra directed by Kurt Masur, he plays here the two Richard Strauss horn concertos and Weber's Concertino in E minor. These are relaxed accounts, totally accomplished, though recorded with murky, cavernous sonics that hardly do justice to the performance. Playing time: 49:15. (Philips 412 237-2.) *R.E.B.*

**STRAVINSKY BALLETS BY MUTI**

Riccardo Muti's Angel recording of Stravinsky's *Petrouchka* with the Philadelphia Orchestra offers a superb performance, indeed an orchestral *tour de force*. Issued on a single CD with a playing time of only 33:24 (An-

gel EMI CDC 47015), though, it is no bargain. Nor, for that matter, are other CDs that offer *Petrouchka* by itself. The Muti/Philadelphia account of Stravinsky's *Le Sacre du printemps* is also available on a single CD (Angel EMI CDC 47102), with a playing time of 34:30. Why didn't Angel issue both of them together on one CD? Wouldn't it be better (and more profitable, perhaps) to release a well-filled CD that would please the consumer? If you don't mind paying top dollar for this music, Muti's performances can be recommended, or try the Claudio Abbado/London Symphony version of *Petrouchka* on Deutsche Grammophon, with a playing time of 34:22 (DG 400 042-2.). *R.E.B.*

**STRAVINSKY FROM DUTOIT/MSO**

Considering the impact the Montreal Symphony and conductor Charles Dutoit have had on the audio world and the fact that they have made some truly outstanding recordings, I was surprised to find this one, of Stravinsky's *Le Sacre du printemps*, disappointing (London 414 202-2). This is a very Gallic view of the score, and the orchestra has difficulty playing the notes. London's engineering is rather veiled and unfocused; the label's earlier recording of the same work, with Antal Doráti and the Detroit Symphony, had superior sound (playing time: 33:37; London 400 084-2.). Even though Stravinsky's *Symphonies of Wind Instruments* is also included on Dutoit's new recording, the playing time is only 44:24. Of competing CD versions, perhaps the finest is Doráti's, closely followed by Lorin Maazel's, if you can take his elephantine approach and don't mind the limited playing time of 33:30 (Telarc CD 80054.). *R.E.B.*

**HOMAGE TO TCHAIKOVSKY**

The 45-minute ballet *The Fairy's Kiss* is Stravinsky's homage to Tchaikovsky, utilizing many of that composer's shorter works and songs as well as some of Stravinsky's own music. Based on Hans Christian Andersen's *The Ice Maiden*, it is a delectable, subtle score. Appropriately, Stravinsky's orchestration of the brief "Bluebird" pas de deux from *The Sleeping Beau-*

*ty* is included as filler. The performances by Neeme Järvi and the Scottish National Orchestra are superb, with vivid, resonant reproduction. Playing time: 50:51. (Chandos CD 8360. Distributed by Harmonia Mundi, U.S.A.) *R.E.B.*

**ARGERICH PLAYS TCHAIKOVSKY**

Martha Argerich's brilliant performance of Tchaikovsky's Piano Concerto No. 1 with Charles Dutoit and the Royal Philharmonic is now coupled with her equally brilliant rendering of Prokofiev's Piano Concerto No. 3 with Claudio Abbado and the Berlin Philharmonic. These are analogue recordings, dating from 1971 and 1967, respectively, but the sound is superb. Playing time: 62:39. (Deutsche Grammophon 415 062-2.) *R.E.B.*

**DANCES FROM VIENNA**

A total delight! Here is nearly an hour of captivating mid-19th-century Viennese music played by a small string ensemble—the Ensemble Bella Musica de Vienne, ably directed by Michael Dittrich—occasionally complemented by flute and guitars. Works of Stroh-mayer, Lanner, Diabelli (of Beethoven-variation fame), Stelzmüller, Mayer, and Johann Strauss Junior and Senior are included on *Vienna Dances 1850*. Performances are spirited, and the sound is brilliant, very close-up, but rich: On occasion you can hear one of the players breathing. Highly recommended. Playing time: 57:34. (Harmonia Mundi HM 90.1013.) *R.E.B.*

**VIVALDI LUTE COLLECTION**

Daniel Benko is lute soloist with the Franz Liszt Chamber Orchestra conducted by Janos Rolla in a collection of Vivaldi concertos and trios for lute and other instruments. Well played, but not so well recorded—very close up, without much space around the instruments. Playing time: 46:04. (Hungaroton HCD 11978. Distributed by Qualiton Imports, 39-28 Crescent St., Long Island City, N.Y. 11101.) *R.E.B.*

**EARLY WAGNER**

The year 1836 was not a good one for Wagner. Newly married, in debt, and unrecognized, he composed the *Polo-*





"SCARECROW": FOR ROCK 'N' ROLL LOVERS

nia Overture, a banal piece of little inventiveness, followed by the even more vapid *Rule Britannia Overture*, a tedious repeated statement of Arne's familiar tune. Each of these works lasts more than twelve (!) minutes, and neither of them, for very good reason, adds to Wagner's fame. The two marches—*American Centennial* and *Imperial*—are more familiar, but they, too, are far removed from the composer's better efforts. The Hong Kong Philharmonic, conducted by Varujan Kojian, does not sound like a very large ensemble, and here it is recorded with an unappealingly shallow, dry quality. This CD is only for those who must own early works of Wagner, no matter how undistinguished. Liner notes are a copy of the LP notes, slightly reduced and twice-folded to fit into the CD box. (The two marches, incidentally, were far better served by Marek Janowski and the London Symphony Orchestra on a now-deleted LP: Angel S 36879.) Playing time: 46:07. (Hong Kong 8.220114. Distributed by Harmonia Mundi, U.S.A.) *R.E.B.*

## BAYREUTH "RING" CYCLE

Philips is releasing the entire Karl Böhm *Ring* cycle recorded live during the 1966–67 Bayreuth Festival with a cast as fine as could be assembled at the time (Birgit Nilsson, Theo Adam, James King, Leonie Rysanek, Gerd Nienstedt). The sound of the original LP issue was quite congested, but that has been cleared up in the CD version (of which *Die Walküre* is the only part I've heard). The live-performance aspect is quite exciting. There are a dozen fewer track numbers here than in Georg Solti's historic recording of *Die Walküre*, also available on CD, but you probably won't have too much trouble finding what you want to hear. Playing time: 210:24. (Philips 412 478-2.) *R.E.B.*

# POP/ JAZZ

## LOREZ ALEXANDRIA: Lorez Alexandria Sings the Songs of Johnny Mercer, Vol. 2: Harlem Butterfly.

Albert Marx, prod. Discovery DSCD 905.

Relatively unknown on the East Coast despite a recording career that goes back to 1957, Lorez Alexandria is a poised performer whose clarity and careful taste give her cool-sounding interpretations their own worldly charm. She sings in tones that range from intimate ("Harlem Butterfly") to brassy ("This Time the Dream's on Me"); she seems to prefer slow-to-medium tempos; and she respects composers' and lyricists' intentions. That means her sophistication is never coy or self-indulgent.

It also means she's ideally suited to the lyrics and music of Johnny Mercer, this release being the second of her three albums of Mercer material and the first to be put on CD. On "Love's Got Me in a Lazy Mood," she's both apparently weary and secretly pleased. (Herman Riley's obbligato on soprano saxophone, however, is *too* lazy.) Like many other singers, Alexandria gets impatient with the repeated notes in "Come Rain or Come Shine," but her decorations on its bare-bones structure are supple and appealing. "Skylark" is daringly introduced a cappella; she bends the "anything" of the first line so broadly that it sounds like she's slipping down a slide. But Alexandria rarely shows off. She's inventive and yet has both feet on the ground. I can imagine just one serious complaint about this disc: It's only a little more than 30 minutes long and could easily have included Vol. 3 of the Mercer series. Otherwise, it's a find. *M.U.*

## JOHN COUGAR MELLENCAMP: Scarecrow.

Little Bastard and Don Gehman, prods. Riva 824 865-2.

On *Scarecrow*, John Cougar Mellencamp reaffirms his formal commit-

ment to rock 'n' roll's basic unit, spelled B-A-N-D. For several years now, he has toured, written, recorded, and even made his excellent videos with the same outfit: two guitars, bass, and drums. These guys hit the top of the charts in the summer of '82 (*American Fool*: "Hurts So Good," "Jack & Diane") and flashed real brilliance the following year (*Uh-Huh*: "Crumblin' Down," the extraordinary "Pink Houses"). *Scarecrow* features the same melodic slash-and-burn architecture, constructed around the twin lodgepoles of Larry (he *can* play a guitar just like ringin' a bell) Crane's pealing acoustic chords and Kenny (the Timekeeper) Aronoff's keep-the-needle-in-the-red sledgehammer drumming. The carefully engineered tension between the resonant, woody dynamics of the layered guitars and the brutal crunch of the overmodulated drums drives the entire album: The band just keeps chiming and chugging. If you can't find several tracks to love here, then you do not love rock 'n' roll.

But Mellencamp's vision of America and his place in it does seem to be changing. Where previously his most clear-eyed and admirable energy was focused on folks who could never have dreamed of owning a farm ("Jack & Diane," "Pink Houses," "Golden Gates"), the new CD's "Rain on the Scarecrow" is devoted to the families losing theirs. This is a bigger shift than it would seem at first, requiring this perennial outsider to take an insider's stance, to cross some charred bridges back to the Heartland's tried and true. When a thinking person makes his peace with the same old trouble he's been having for years, it's a mark of maturity. So why, then, on "The Face of the Nation," is Mellencamp wondering "what happened to the golden rule"? I thought he'd explained *exactly* what happened to it on *Uh-Huh*. And the same song's generalized anxiety about loneliness and suffering is overcome "for me and you," babe. Jeez, this could be Beaver Brown! Perhaps he should slow his rapprochement a bit so he doesn't forget what he learned when he was out there on his own. As for tough-minded political convictions, "Justice and Independence '85" is the





**AL GREEN: GOLD COLLECTED ON COMPACT DISC**

silliest allegory since John Fogerty's "Zanzibar." I'd like to think its heart is in the right place, but it's so muddled I don't know where the heart actually is. I can hear it beating, though.

*Scarecrow's* best songs steer clear of the state of the nation, keeping to the particular, to simple thoughts and actions closely observed. In "Small Town," Mellencamp lays out his identity and destiny with such disarming ease and clarity that it takes my breath away; the band piles guitar upon guitar over Aronoff's fail-safe sticks, building with organ and plaintive harp (John?) to a perfect acoustic-chord climax. What a track! "Lonely Ol' Night" is a fine radio single, tender and tough in just the right proportions, and it's even finer on CD. In "Rumbleseat," the imagery of confusion and personal travail has both poignance *and* humor, a Hoosier specialty.

All these power chords and precise details sound especially good in the CD format. Mellencamp and his console partner, Don Gehman, are underrated as producers, and this recording, with its wealth of texture—tambourines and shakers and lots of acoustic guitars that don't get lost in a thunderous roar or undifferentiated boogie—really shows their skill. *Scarecrow's* crispness and lucidity don't blur or dull no matter how high the tracks are stacked. Again, if you can't find several cuts to love here, then you do not love rock 'n' roll. *J.N.*

**JIM PEPPER:  
Comin' and Goin'.**

Jean-Pierre Weiller, prod. Rykodisc RCD 10001. (400 Essex St., Salem, Mass. 01979.)

Jim Pepper is a husky-toned tenor saxophonist whose credits include Charlie Haden's Liberation Jazz Orchestra. He's also a Kaw Indian, and on *Comin'*

*and Goin'* he tries to integrate this heritage with his jazz background, playing two songs by his father, a couple of chants of his own, and an arrangement of a traditional Sioux piece, "Lakota Song." A set that includes Indian chanting by amateur vocalists, interspersed with occasionally shrieking saxophone solos, and lyrics like "All this speed feeling springing round my head/ Makes me feel glad that I'm not dead" may sound forbidding. This one is not, partially because of the talent involved—guitarist John Scofield, for instance, and Codona (Don Cherry, the late Colin Walcott, and percussionist Nana Vasconcelos)—and partially because of the easygoing lyricism of the compositions.

In fact, if I have a complaint about the music here, it's that it's too smooth and occasionally derivative. The chanting on "Witchi Tia To" introduces a memorable but unchallenging theme. Pepper's vocal on "Squaw Song," the only piece that features Cherry, bears an uncanny resemblance to Bob Dylan circa "It Ain't Me, Babe," and elsewhere his arrangements sound like Carla Bley's. "Malinyea," written by Cherry and previously recorded by Codona, owes something to the original, but Pepper's jaunty, syncopated beat eventually trivializes the tune: When Cherry plays it, it has an edge.

Still, all of Pepper's compositions sing memorably, and the solos—Scofield's countryish choruses on "Comin' and Goin'," Pepper's Pharoah Sanders-like hollers on "Goin' Down to Muskogee," and Vasconcelos's turns in various spots—make up for the campy quality of Pepper's lyrics. The Indian chants may come out of a different world, but those vocals, especially by Jane Lind and Caren Knight on "Lakota Song," have their own attractions. One final word: This disc, engineered by David Baker, has about the best sound I have heard on a jazz CD. *M.U.*

**SMOKEY ROBINSON AND THE  
MIRACLES:**

**Compact Command Performance:  
18 Greatest Hits.**

Smokey Robinson and various prods. Tamla TCD 06071TD.

**AL GREEN:**

**Compact Command Performance:  
14 Greatest Hits.**

Willie Mitchell and Al Green, prods. Motown MCD 06111MD.

Twenty years ago, when Bob Dylan cited William "Smokey" Robinson, the amazing lead singer and songwriter of the Miracles, as his favorite poet, Mr. Dylan's stock shot way up in my house. Bob has since tried to weasel out of the pronouncement, but then he has spent the better part of the last two decades trying to undo all his best work. Smokey has simply spent the last two decades taking care of business.

What makes this CD so important is the sad but undeniable fact that Tamla/ Motown records were miserably pressed. We're not talking persnickety audiophilia here, just the reasonable desire of a man who loves the tune to hear it without the snap-crackle-pop that was the hallmark of the labels' quality control in their glory years. In a commendable—and thrilling—reversal, the CDs in this *Compact Command Performance* series are compiled meticulously, transferred directly from the original master tapes. For the first time, you can hear everything on "The Tracks of My Tears": Marv Tarplin's typically understated guitar intro, Smokey's last sob, and all details in between. This sonic sanitation is a joy throughout, from "Going to a Go-Go" to "I Second That Emotion" to "Cruisin'." And the lush doowop ballad "(You Can) Depend on Me" is a true digital revelation.

Because the song selection tries to be representative right into the '80s, the disc leaves out too much of the brilliant mid-1960s Miracles, including some personal faves ("A Fork in the Road," "The Love I Saw in You Was Just a Mirage," "My Girl Has Gone") and some *essential* work: the elegant "More Love" and the sublime "Ooo Baby Baby." Still, I'm thankful for what I've got.

Because Al Green never recorded for Motown, his CD doesn't have to readdress the same old grievances as Smokey's. Green's hits—all made in the '70s and cut in the same Memphis studio with the same producer/engineer (Willie Mitchell) and many of the same players (the Hodges brothers, the late





WILLIE NELSON AND BRUCE SPRINGSTEEN

Al Jackson, Jr.)—were better recorded and pressed to begin with. This collection is reasonably comprehensive, from Green's slowed-down Southern version of "I Can't Get Next to You" and his transcendent "Love and Happiness" to the churning original of "Take Me to the River," and it includes seven of his nine gold records, beginning with "Tired of Being Alone." The sound is as good as it can be after the fact, with every sigh and slide in his voice palpably present in the room, and with the hiss of the original master tape audible only at high volume. And now I can listen to "Here I Am (Come and Take Me)" or "Let's Get Married" over and over just by pushing a couple of buttons. That's heaven to me. *J.N.*

### McCOY TYNER: *Fly with the Wind.*

*Orrin Keepnews, prod. Milestone FCD 601-9067.*

Part of Milestone's effort to present McCoy Tyner in new settings, the 1976 *Fly with the Wind* set up the pianist with a string section, a harpist, and an oboist; the rhythm section featured bassist Ron Carter and drummer Billy Cobham. Tyner shared the soloing with flutist Hubert Laws and did the arrangements himself. The LP, though well received when it came out, seemed to me flawed by the quality of the sound and by the relative fussiness of Tyner's writing, particularly for strings; the ensemble is overly busy, but the violins are simply unnecessary.

I was curious to find out if the Compact Disc could clarify so many different voices. To some extent, it does, but the band still sounds as if it's jammed onto a too-narrow stage, too close to the audience. (How do classical recordings get that sense of *space* in the strings?) Cobham's drums are everywhere: One tom-tom is positioned so far to the left that it's hard to believe

it's part of the rest of his drum kit; elsewhere, he's so spread out that the rest of the band seems to be playing in his lap. This disc improves substantially when the sound is thinnest: Tyner opening "Salvadore de Samba" over Cobham's woodblocks, Cobham's duet with Carter on the same track, Laws's alto flute solos, and the thoroughly lyrical "Beyond the Sea." Tyner's solos—with their steely trills, shakes and rolls, crisp single notes, and resounding chords—are as exciting as ever, but his clarity is almost overwhelmed by the shrill sound of a hyperactive accompaniment. *M.U.*

### VARIOUS ARTISTS: *We Are the World.*

*Various prods. Polygram 824 822-2.*

Hot on the heels of Live Aid, the event-of-the-millennium-till-the-next-one, it seemed appropriate to take a second look at the event-of-the-millennium-till-that-one, USA for Africa's "We Are the World." So one recent evening at the Compassionate Digital Pleasure-dome, we slipped into something comfortable and listened to the CD version of the *We Are the World* album.

Designated "The Historic Recording" on the cover, the familiar (but not unpleasantly so) six-month-old title chartbuster retains its modest charms and *Life*-magazine spectacle. It's a digitally-mixed analog recording, yet the massed chorus, which I'd hoped would be immediate and overwhelming, actually sounds rather distant and clinical on CD. The collage of individual lead-vocal fragments, however, definitely benefits from digital technology's enhanced presence as much as from the careful ministrations of producer-to-the-stars Quincy Jones. His all-night task, cited in the credits as "solo vocal choreography," remains a jigsaw delight: Dionne Warwick and Willie Nelson must be the all-time serendipitous duet combination, Tina Turner and Billy Joel the most unfortunate. Overall, though, lack of unpleasantness is still the song's salient characteristic—one it shares, not surprisingly, with ubiquitous co-writer Lionel Richie, the tirelessly bland and borderline inoffensive cheerleader-cum-ham who gives new dimensions to Easy Listening. Here,

the listening is so easy that, as with a lot of yuppie media, it's nigh on impossible to distinguish promotion and advertising from editorial: the dread "advertorial" fungus.

"We Are the World" is, in fact, the most extravagant soft-drink commercial ever made. The concept alone far outstrips previous memorable achievements in the genre, such as the incandescent Aretha Franklin/Ray Charles radio spot of several years ago and the happy surprise of Aretha's recent TV track for the "new" Coke. Perhaps she wasn't invited because Richie insisted on Pepsi-identification. I didn't see Bill Cosby there, either.

This collection also includes "nine new superstar songs," a very mixed bag that zigzags drunkenly from the execrable through the acceptable to the sublime: from Chicago's creepily out-of-place (and aptly titled) "Good for Nothing" through Steve Perry's typically attractive but chronically contentless singing on "If Only for the Moment, Girl" and Prince's hypnotic but chronically crypto-scriptural "4 the Tears in Your Eyes" to Bruce Springsteen's live Jimmy Cliff cover, "Trapped," and Tina Turner's brilliantly performed "Total Control." The programming and remote-control functions of my CD player proved extremely helpful.

Except for a handful of Bruce or Prince completists, however, the overwhelming majority will have purchased the album, cassette, or CD to own the most expansive, most public-spirited jingle to date and, of course, to do a little good in the bargain. The very notion of assembling dozens of stars to record an expertly produced, massively supported commercial for the starving—not, mind you, a raggedy ersatz Xmas carol—could only occur in California. Charitable Hootenannies of the Rich and Famous... Ah, well, from each according to his abilities, to each according to his needs. Finally, I find this sleek, uplifting, middle-class entertainment a curiously refreshing tonic compared to Live Aid's marathon orgy of self-congratulation and geopolitical naiveté. Nobel Prize, my ass. USA for Africa just wants to buy the world a... Pepsi. *J.N.*





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